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Developing pro-environmental motivations through urban farming in schools

Thesis

Submitted in the fulfillment of the
academic requirements for the degree of
Doctor of Philosophy
in Science Education

by
Deborah Dutta

Thesis Advisors: Sanjay Chandrasekharan, Ankush Gupta

Homi Bhabha Centre for Science Education,
Tata Institute of Fundamental Research, Mumbai.
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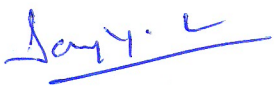
DECLARATION

This thesis is a presentation of my original research work. Wherever contributions of others are involved, every effort is made to indicate this clearly, with due reference to the literature, and acknowledgement of collaborative research and discussions. The work was done under the guidance of Professor Sanjay Chandrasekharan and Ankush Gupta, at the Tata Institute of Fundamental Research, Mumbai.

[DEBORAH DUTTA]

In my capacity as supervisor of the candidate's thesis, I certify that the above statements are true to the best of my knowledge.



[SANJAY CHANDRASEKHARAN]

[ANKUSH GUPTA]

Date: 3 December 2019

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This thesis is a story of relationships based on care, both in its making and its conclusions. It began with my desire to do research based on authentic and sustained engagement with the field (both literally and figuratively), based on some brief but wonderful experiences at the Nai Talim school, Wardha. At that juncture I was wisely warned by my guide, Sanjay Chandrasekharan, that turning an intuition into compelling arguments is an arduous task. Yet, once he realised that my heart was set on the topic, he pushed me beyond anything I could have imagined. He spent countless hours helping me shape the questions, providing larger perspectives, and thoughtfully turning my passionate, yet sometimes incoherent narratives into sound arguments. He has been extremely patient in hearing my views, and went way beyond his area of expertise in order to engage with the literature I was struggling to understand. I have never hesitated to barge into his office to share any idea, concern or grievance. He has been a wonderful mentor in every sense of the word, helping me navigate the academic world without feeling too overwhelmed. Ankush Gupta has been a supportive guide as well, often acting as a patient sounding board for ideas and thoughts. His pragmatic advice on a variety of topics has helped me embrace a more reflexive standpoint. Additionally, the thesis advisory committee consisting of G Nagarjuna and my supervisors provided me with the intellectual guidance, encouragement, and thoughtful critique that is crucial to any academic endeavour.

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Abstract

A key mandate of environmental education (EE) is to motivate people to engage in environmentally responsible actions. However, EE has had limited success in facilitating impactful actions. This is partly because of the information-oriented structure of current EE, which assumes that knowledge directly leads to motivation and action. Recent models of cognition reject this knowledge-driven information-processing approach, based on models where action and embodiment are the central theoretical constructs. However, there is little empirical work examining the linkages between embodied action and the emergence of pro-environmental actions (PEA) in EE research and environmental psychology. This thesis project explores the role of embodied action in generating PEA, and proposes a general model of the way motivation emerges from embodied interactions within communities.

This process-oriented model of the development of PEA is based on an exploration of the way community practices support individual motivation and action. Drawing on a number of instances of community-level practices that have helped promote PEA, I propose urban farming as a model system to study the way these participatory designs helped generate pro-environmental motivations. Based on this proposal, I conducted a year-long observation of a community farm as a participant-observer, to understand in detail the way PEA could emerge from such community practices. Data from this case study showed that while volunteers participate in such community initiatives based on various individual motivations, PEA emerges from sustained interactions with salient artefacts that are part of the community practice. This is because these artefacts and

practices embed different aspects of an ecological stance (such as interdependence, diversity, recycling etc), and interaction with them leads to embodied experiences that shape pro-environmental motivations and wider perspectives. Based on these findings, I propose an enactive account of the way motivation is constituted through social and practice-based interactions within a community.

Extending these findings, I designed a school-level intervention to promote PEA, based on a terrace farm. The intervention showed that interactions in the farm led to the development of PEA in students, to the extent that they extended farming and other pro-environmental actions to their apartments and communities. Interviews with students and field observations indicate that sense-based interactions, instances of *enchantment,* and feelings of novelty and challenge were significant triggers for the emergence of these pro-environmental actions and motivation in students. Further, the teaching/sharing of these actions, as part of group activities, acted as social motivation. These findings extend the account of motivation developed in the first study, to include trajectories of wider participation (away from the original site of practice).

The results from these two studies, and the model of motivation derived from them, indicate that community-based embodied practices can support the development of action-oriented pedagogies for developing ecological sensibilities. Further designs based on this model could help seed environmental perspectives in students, rooted in the ideas of interdependence, care, and the well-being of more-than-human living beings. Key policy recommendations that follow from these studies and the proposed model include imagining schools as community-outreach hubs for environmental remediation, and training teachers to develop local, context-based EE interventions.

Graphical Overview of the Thesis

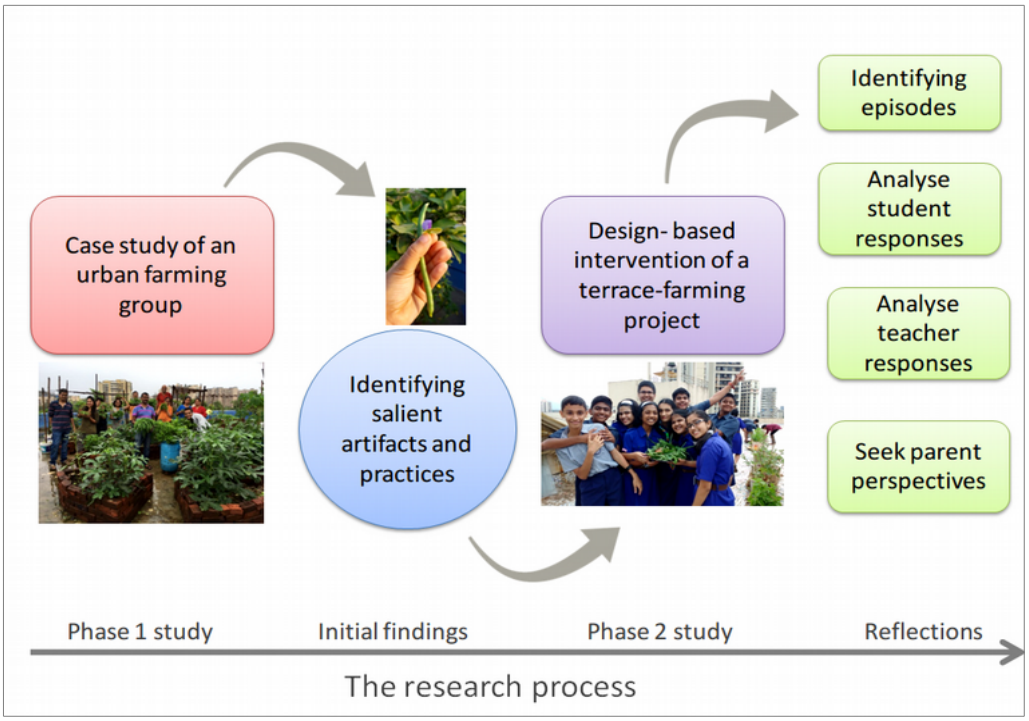

Figure 1: Thesis at a glance

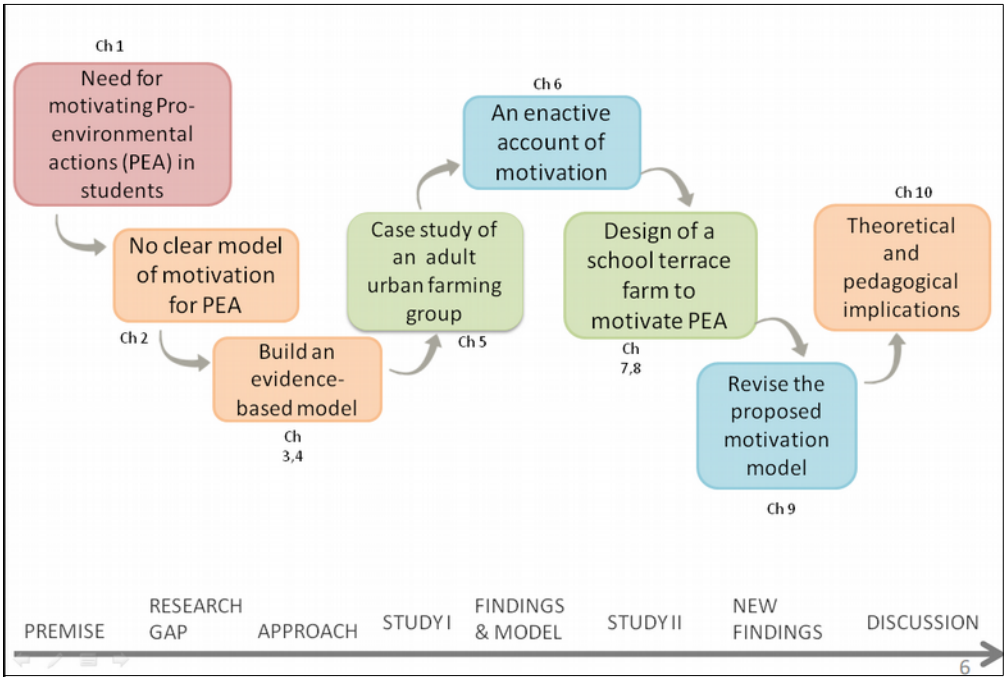

Figure 2: Overview of the research trajectory

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The need for EE to result in impactful, sustained, and collective pro-environmental actions

Promoting pro-environmental action (PEA) is a core aim of environmental education (EE). However, mainstream approaches to EE focus on providing just information about the environment. As the link between information and action is complex, such approaches have been unsuccesful in supporting the development of impactful pro-environmental actions. Further, the excessive focus on individual actions – rather than community initiatives – has limited research on ways collective action could emerge to support the environment.

In contrast to information-based EE's failure to promote PEA , existing initiatives based on community-based practices have been successful in initiating and sustaining pro-environmental actions. Characterising the important features of such practices could support the design of EE interventions that can seed PEA.

Ch 2: Review of literature

The need for evidence-based linkages between environmental experience, motivation and action

Multiple strands of research in EE identify salient experiences as an important factor contributing to PEAs. However, what counts as salient experiences is an evolving topic of research. Further, how these experiences translate into motivation, as well as the way they provide competencies to act in pro-environmental ways, is not clear. Most research focusing on motivations underlying PEA assume an information-processing model, where

motivation is treated as innate, acting on the information *gathered from* the environment. Such models fail to capture the dynamic process by which motivation evolves through *engagement with* the environment. This dynamic and process nature of motivation needs to be characterised clearly, to develop pedagogic models that support students to act in pro-environmental ways.

Ch 3: Research Approach

Studying practice to develop an intervention design

One way to develop a process-oriented understanding of PEAs would be to explore cases of successful community-based environmental practices, to understand how community practices support individual motivation and action. Following this reasoning, I studied a community urban-farm, to understand volunteers' motivations. In the Indian context, urban-farms provide an interesting intersection, where alienating urban lifestyles and structures meet traditional farming practices. The objective of this study was to characterise how elements of practice influenced invidual motivation, and its effect, in turn, on the overall community. Based on a model of motivation based on this data, and the identified salient features of this community-based motivation process, a terrace-farm-based pedagogy was designed, to study the development of pro-environmental motivations and actions at the school level.

Ch 4: Research Design and Method

A case-study based on participant-observation, followed by a design-based intervention

Given the broad and open nature of the research question (how community practices help support individual motivation) case study was identified as an appropriate study method. Participant-observation was chosen as the data collection method, to gain an indepth and close understanding of the various community activities, as well as to help praticipants trust the researcher, which was required for participants to share their experiences and narratives. The data collected comprised of interviews, observation, handling of artifacts, photos, and WhatsApp® logs. The data from all these sources were integrated and qualitatively analysed, drawing on emergent themes. The theoretical lens used was situated and embodied cognition.

Based on the salient practices and artifacts identified in the community-farm, a school terrace-farm was designed. Activities in this farm were then observed similarly by the researcher, and this data was integrated as a second case-study. Data collected comprised of student, teacher and parent interviews, videos, photos, students' farm diaries. Qualitative analysis was used to thematically describe the range of responses and episodes on the farm. The analytical framework used in this study was largely inspired by situated and embodied cognition ideas, along with cultural-historical activity theory, given the focus on sensorial and corporeal dimensions of farm activities. This approach also decentres anthropocentric narratives, and focuses on interrelationships with artefacts and their emergent properties.

Ch 5: Case-study of a community-based urban farm

Salient elements of the community-based practice include 'Performative' substances and 'Coagulative' practices. These elements help provide a process-based understanding of how pro-environmental actions emerge in volunteers through participation in the community practice.

The findings from the case-study of the urban farm indicate that volunteer perceptions changed over a period of time through practices such composting, making nutrient-rich soil and saving seeds. Participation in a 'coagulative' practice – a set of actions that generate an understanding of the interdependence of elements in the environment (such as the symbiotic relationship of livestock and a farm, and the need for biodiversity for a healthy ecosystem) – was found to be an important process for ecological ideas related to farming to coalesce together, through community feedback, into an integrated view of the environment. This coagulation gradually leads to amorphous ideas about the environment becoming more substantive and actionable.

Built ecological artifacts, such as nutrient-rich soil, can be described as 'performative substances', which help embed and embody a specific stance towards nature. Working with these substances allow volunteers to understand the embedded ecological ideas in an enactive and embodied (i.e. non-descriptive) way. Together, such artifacts and practices play an important role in developing volunteers' perspectives towards the environment, and guide their actions in the community.

Ch 6: An enactive account of motivation

A dynamic model of the emergence of motivation in individuals, based on interaction with artifacts and the community, is proposed.

The study data showed that valued practices of composting, making good soil, and saving seeds, slowly coalesce together, to develop an integrated view of the environment that is in alignment with wider perspectives held by the core members of the group. Volunteers' increasing levels of competency at various tasks on the farm provided a positive motive to explore more actions in related areas, and an increasing number of concerns started making sense in relation to this growing process. This expansion of personal interests in turn drove further actions, thus creating a positive feedback loop between motivation and action. Sustained actions, enabled by performative and coagulative substances such as *Amrut Mitti,* evolve into narratives that support ideas such as frugality, reuse and reduce. I capture this process using a Artifact-Performance- Feedback-Coagulation Model. This account extends the emerging embodied cognition framework, to include motivation, and capture the way model feedback loops coalesce into larger narratives.

Ch 7: The design and study of a school terrace farm

Somaesthetic encounters, involving feelings of 'enchantment', play an important role in developing an attentive relationship with the environment. Such relationships can form the basis for widening areas of action in the community.

The school terrace farm was designed on the basis of the motivational model and operational principles developed through the study of volunteers in the urban farm, particularly the idea of performative substances and coagulative practices. Apart from the

effect of these interactions in generating PEA in students, the farm study also examined whether/how students extended school farm practices to their wider communities.

Results from the study indicated that students experienced a range of novel sensory encounters while growing plants, and received salient feedback through visible growth of the plants and subsequent harvests. The open-ended quality of the activity provided challenging and novel experiences for them. The novelty of encounters, such as soil fauna, fungus, fruiting bodies etc., allowed for instances of 'enchantment', a term used by environmental political theorist Jane Bennet to describe moments of awe that deepen one's engagement with the more-than-human world.

Successfully engaging with some of the challenges involved in farming motivated many students to extend similar initiatives to their own homes and communities. They started farming activities such as composting and growing plants at their homes, especially in collaboration with elderly family members. Interviews with teachers, parents and students indicate that such collaborative activities were rewarding by themselves, and acted as a significant motivator to engage in further PEAs.

Ch 8: Extending the motivation model

Somaesthetic encounters and the possibility of joint-actions motivate wider participation and care-based interactions

Based on this data, I extend the model of motivation proposed earlier, to include the role of multi-modal sensory experiences, and the possibility of sharing these with other individuals, in motivating children to expand their sphere of activities into their neighbourhoods. In particular, I focus on the way students' actions at the terrace farm

transform and extend their action space, i.e. the *possibility* of actions in their extended environment. These action possibilities make the environment more meaningful, and contribute to the forming of different kinds of new relationships. More broadly, somaesthetic interactions and joint-actions provide additional dimensions that extend the initial model of motivation.

Ch 9: Teachers' reflections

Teachers' narratives indicate the possibility of using the farm as a transformational space, helping restructure their own identity as well as pedagogical practices. The teachers' experiences also highlight the boundaries created by disciplinary affiliations.

In order to understand the impact of the project within the school, data was collected on the views and actions of teachers directly or indirectly involved in the farming activity. This included teachers' perceptions of students working at the farm, connected initiatives within the curriculum, and any personal efforts prompted by their involvement with the school terrace farm. The data showed that direct and sustained engagement contributed to perceived changes in teaching practices, as well as personal initiatives. In the absence of direct participation, conventional teaching practices seems to provide a dominant lens to understand the farming space. These observations are discussed in the backdrop of challenges involved in facilitating environmentally-oriented teacher education in the Indian scenario.

Ch 10: Discussion and implications

The findings from the two studies indicate that community-based pro-environmental practices, and their analysis, can provide interesting insights towards developing action-oriented EE. The first study highlighted 'Performative' substances and 'Coagulative' practices as salient markers of a sustainable community-driven practice. More such parameters could emerge from the analysis of other community initiatives, such as watershed management, forest preservation, waste management and so on. The study indicates the dynamic and process nature of motivation. The second study showed the role of social motivation through joint-actions, particularly the way they provide a possible mechanistic account of the way PEA could extend to other locales and community members.

From an educational perspective, this work opens up a promising pedagogical path to develop PEAs, based on environmental experiences that foster sustained somaesthetic, open-ended encounters, as well as community-based feedback and ownership. I propose designing school spaces as environmental outreach hubs, focused on extending school-level action-spaces into the local community. Some policy recommendations that follow from these results and models, for scaffolding action-oriented EE, are developed and discussed.

Definitions of terms used

Term	Meaning
Affordances	Affordances are functionally significant properties of the environment which are defined by the relationship between the environment and an organism.
Amrut Mitti	Organic nutrient rich soil made by composting dry leaves soaked in dilute mixture of cow-dung, cow-urine and jaggery.
Amrut Jal	Organic accelarator made using a mixture of cow-dung, cow-urine and jaggery diluted 10 times in water.
Coagulative Practices	A set of actions that generate an understanding of the interdependence of elements in the environment, mostly in an implicit manner.
Ecosystem	A biological community that occurs in some locale, and its relationship with the physical and chemical factors that make up its non-living or abiotic environment.
Motivation	A psychological drive to complete or avoid a goal that depends on social norms, situational factors, and perceived costs.
Performative Substances	Participatory artifacts which embed and embody a specific stance towards nature. Engaging with these artefacts allow participants to understand the embedded perspectives in an enactive and embodied way.
Practice	A set of inter-related actions within a larger structure (community or system)
Pro-Environmental Action	A deliberate strategy that involves decisions, planning, implementation, and reflection to achieve a specific positive environmental outcome.
Solving for Pattern	A process of engaging with the environment, proposed by American farmer and writer Wendell Berry, where the larger sustainable eco-social patterns within which a practice is embedded are not adversely disturbed by the interventions. (eg: food webs not being disturbed by farming practices)
Somaesthetics	An interdisciplinary field of inquiry that uses the body as a locus of sensory perception, performance and experience.
Values	Relatively stable trans-situational beliefs regarding desirable outcomes, behaviours or things.

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Figure 9.3..... (Left) Samiksha growing edibles at her home; (Right) Her collection of dried leaves

Chapter 1 Introduction

The need for Environmental Education (EE) to result in impactful, sustained and collective pro-environmental actions (PEAs)

"The volume of education has increased and continues to increase, yet so do pollution, exhaustion of resources, and the dangers of ecological catastrophe. If still more education is to save us, it would have to be education of a different kind: an education that takes into the depth of things." —E F Schumacher (1974)

In this chapter

A key mandate of environmental education (EE) is seeding pro-environmental actions in society, so that humanity can move to a sustainable future (Wals, 2007, 2011). However, dominant models of EE seek to provide students just information on the environment, with the assumption that this information will lead to pro-environmental actions (PEAs) and motivation (Hungerford & Volk, 1990; Hannigan, 1995). This information-based approach stems from the early association of EE with Science Education and influential theories of cognition that view the mind as an information-processor. Further, dominant forms of EE tend to focus on individual actions in private spaces (such as using water wisely, segregating waste etc.) (Shimray, 2016) – rather than community initiatives (Krasny & Tidball, 2010) – and this has limited the development of interventions that focus on collective action to support the environment.

In contrast to mainstream EE's failure to promote PEA in a collective manner, initiatives based on community-based practices have been successful in seeding and sustaining pro-environmental actions. The important features of such practices are

currently unknown, and characterising these features could support the design of EE interventions and education policy that can seed pro-environmental actions.

1.1 Background: A crisis in making

The hallmarks of human civilisation include artifacts and systems designed to create habitable niches in every part of the environment. Given that almost every area on the planet bears the mark of human habitation, human activities, augmented by technology, have become a major force in creating geological signatures that could last millennia. This has prompted geologists to term the present epoch as 'Anthropocene'. Yet, the term isn't meant to glorify our achievements; it serves as a reminder of the drastic changes in the ecosystem, most of which have had adverse effects on living beings. By producing almost 300m metric tonnes of plastic annually, of which almost 50% are single-use plastics (Vaughan, 2016), we have created mega pollution sites such as landfills and the great Pacific garbage patch (Eriksen et al., 2014), which are testimonies of the damaging impact of our actions on the planet's ecosystems. Industrial production of nitrogen-based fertilizers for large-scale mechanized agriculture have had the largest impact on Nitrogen cycles in 2.5 billion years (Vitousek et al., 1997). This has had a fatal effect on the ecosystem, leading to acidification of soil, water, and increase in greenhouse gases. Due to climate change, increasingly erratic weather patterns have become a common occurrence, often resulting in catastrophic events, such as the record high-temperatures across Europe, floods in coastal areas across India in 2018-19, and Hurricanes (Category 4, 5) Harvey, Irma and Katia that successively hit the east coast of Mexico and US in September 2017.

Environmental movements have been trying to alter human actions for several decades

with limited success (Heimlich & Ardoin, 2008; Kollmuss & Agyeman, 2002; Steg & Vlek, 2009), even as environmental issues form a significant chunk of the public discourse and imagination, based on popular documentaries (like Home, The age of the stupid, Planet Earth etc.) and movies (like Avatar, 2012, Carface etc.). A wry comment by Brown and Toadvine (2003, ix) sums up the irony, “While we may not yet be walking the green walk, we are well on the way of mastering the green talk.”

1.2 Emergence of Environmental Education (EE)

Knowledge about the environment is not new. In fact, in evolutionary terms, humans have always had an intimate understanding of the environment, as we have spent most of our time on the planet foraging and hunting in forests, or engaging in farming. However, different from this knowledge acquired through *participating* in the environment, current EE provides knowledge *about* the environment. This descriptive approach within the formal education system is largely a crises-driven modern agenda, which came into being in the 1960s, when some scientists turned their attention to ecological problems caused by techno-scientific enterprises. A major focus of these nascent environmental movements, when translated into educational endeavours, was creating public awareness of various ecological problems (Carson, 1994; Ehrlich & Ehrlich, 1990; Hardin, 1968). In a 1970 landmark meeting of the International Union for Conservation of Nature (IUCN), the term 'environmental education' was defined as follows:

Environmental education is the process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture, and his biophysical surroundings. Environmental

education also entails practice in decision-making and self-formulation of a code of behaviour about issues concerning environmental quality. (IUCN, 1970)

Support from key international institutions helped focus this approach to EE. For instance, in 1972, the first United Nations Conference on the Human Environment was held at Sweden, and 26 principles to guide future actions were declared. Among the points, the statement "Environment Education is essential" is mentioned. In 1977, the first Intergovernmental Conference on Environmental Education was held in Tbilisi, Georgia, and it put forth the foundational aims of EE as follows:

(a) *To foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas;*

(b) *To provide every person with opportunities to acquire the knowledge, values, attitudes,*
commitment and skills needed to protect and improve the environment;

(c) *To create new patterns of behaviour of individuals, groups and society as a whole towards the environment*

In 1987, on the tenth anniversary of the Tbilisi conference, a meeting to deliberate over progress (or lack of it) was held in Moscow. The need for widespread awareness regarding environmental issues was reiterated here, as evident in the following excerpt from the opening address:

In the long run, nothing significant will happen to reduce local and international threats to the environment unless widespread public awareness is aroused concerning the essential links between environmental quality and the continued satisfaction of human needs. Human action depends upon motivation, which depends upon widespread understanding. This is why we feel it is so important that everyone becomes environmentally conscious through proper environmental education. (UNESCO,1987)

Educational institutions were seen as pivotal in providing people with information and awareness, which were *assumed to automatically result in pro-environmental actions*. However, as we discuss in later sections, this model of human behaviour has not been successful in the case of environmental actions. Many critiques of this model have been posed from within the EE field itself, and the conceptualisation of environment and education have changed with time. Given the multiplicity of meanings and approaches that now exist within EE, Sauvé (2005) describes it as a 'complex and evolving pedagogical field'.

1.3 Indian policy on EE

Indian thinkers paid attention to environmental education even before the environment become a topic of interest at the international level. This was partly due to India's particular geography, but socio-historical events such as the British occupation and the freedom struggle also significantly contributed to this interest. Initial efforts to formally include environmental practices within education were seen in Gandhi's formulation of education (Sykes, 1987), known as Nai Taleem, which stemmed from his understanding of local community and family as the basic unit of sustenance and resilience. His vision of education was thus focused on learning of practical skills that would contribute to local society. As a result, activities such as weaving, pottery and farming were seen as an integral part of the curriculum. Similar ideas were found in Tagore's Shiksha-sastra, a school founded in Shantiniketan, West Bengal.

Though conceived as a resistance movement against the colonial system of education, which was aimed at creating employees for the British administration, these educational interventions focused on inherently ecologically sustainable practices. However, post-

independence education policies moved away from ideas such as Nai Taleem. This shift began with the government's focus on 'modernisation' through large scale science and engineering projects/ institutions (Sen, 1989; Kalia, 2006). Additionally, the decade after independence saw India struggling with hostile neighbouring countries as well as droughts that resulted in severe food shortage. The global political situation changed, with the United States emerging as one of the dominant players, and led to the USA influencing social and economic decisions within India as well. The convergence of these situations (hostilities, droughts and power politics) led to the US providing ‘aid’ in the form of a hybrid variety of wheat, which needed heavy input of fertilizers to grow (Cleaver, 1972; Kumar, 1996; Shiva, 2016).

Together, these developments in tandem with the insecure aspirations of the fledgling nation irrevocably changed policy-makers' vision for education. The mantra throughout the 1960s thus was ‘modernisation’, which was to be brought about by the wonders of science and technology. India, according to the government, could not afford to stay content with rustic village life, and had to catch up with the ‘progress’ made by western countries. This way of thinking is etched in policy documents, particularly throughout the 1966 policy document on education (Kumar, 1996), where a permanent wedge is cast between core disciplines (such as Math and Science) and 'extra-curricular' subjects such as farming.

The international focus on ecological issues brought back the environmental discourse in India, but now from a western perspective. The National Council for Environmental Policy and Planning was set up in 1972 which later evolved into the Ministry of Environment and Forests. The Centre for Environment Education (CEE) was established in August 1984, with support from the Ministry of Environment and Forests, with a mandate to promote environmental awareness. In 1980, an

environmental activist Anil Aggarwal established a Not-for-Profit organization, the Center for Science and Environment (CSE). Its objective was to function as a public interest research and advocacy organisation. Apart from publishing comprehensive reports on the state of India's environmental health since 1982, the centre focuses on educational programmes, training and research.

In recent years, environment education (EE) in the formal school curriculum has been influenced by two national policy documents: A directive of the Supreme Court, in response to 1991 petition filed by Shri M C Mehta, an eminent public interest attorney, and The National Curriculum Framework (NCF) 2005, by the National Council of Educational Research and Training (NCERT). In 1991, Shri M C Mehta filed an application (Writ Petition (Civil) No. 860 of 1991), asking the Supreme Court to, amongst other things, make the study of the environment a compulsory subject in schools and colleges. As a result, the Supreme Court mandated the University Grants Commission (UGC) to design relevant courses, and appointed NCERT as a nodal agency for EE.

NCERT advocates an infusion approach to EE within the formal school curriculum, which implies the inclusion of an environmental perspective in all subjects from class I to XII. This approach is based on the idea that an environmental perspective requires drawing from various disciplines given its interdependent relationships.

NCF conceptualises EE under the theme of *Habitat and Learning*, and argues that environmental degradation is an effect of the disconnect from one's habitat.

"...as environmental degradation proceeds at an unprecedented pace, we are beginning to realise the importance of taking good care of our habitat. Humankind must, therefore, make an attempt to comprehend its roots, to re-establish links with

its habitat, and to understand and take good care of it." (p.1)

Given this framing, the authors describe the following as the primary aim of EE:

"...expose students to the real-life world, natural and social, in which they live; to enable them to analyse, evaluate, and draw inferences about problems and concerns related to the environment; to add, where possible, to our understanding of environmental issues; and to promote positive environmental actions in order to facilitate the move towards sustainable development." (p.4)

Note that 'sustainable development' is envisioned as a desired aim of EE, despite many critiques of the term, as being ambiguous, and even having a veiled economic agenda (Huckle, 2002; Lele, 2013). Also, the authors assume a straightforward relationship between concern for the environment and the ability to understand environmental problems from a scientific point of view. As a result, the document then emphasizes an inquiry-based approach to learning concepts in science, as a directive to meet the aims of EE. The rest of the document thus elaborates methods of doing science, and employing Information, and Communication Technologies (ICT) to generate more information and experimentation about the environment. The basic assumption is that environmental sensibilities can be generated by creating awareness within a scientific paradigm. The directive to include EE as part of other core disciplines also aims at generating reliable documentation of local environmental phenomena, as evident from the concerns mentioned below.

"There is hardly any good quality documentation available today of the many facets of India's environment ... By inviting not only experts, but also all interested citizens to assess the quality of such projects and augment their results, a self-correcting system could be set up that would lead to an organic growth of our understanding of

the Indian environmental scenario and concrete ways of undertaking positive action. Including such knowledge-generation activities as a part of the educational process would greatly enhance the quality of the educational experience as well." (p. iii)

As a result, policy implementation has predominantly focused on textbook content, and design of activities that can help measure various environmental variables. Other factors that impact environmental actions – such as cultural beliefs, motivation, social and physical infrastructure, etc. – haven't been given much thought, at the level of theorisation and implementation.

1.4 The rhetoric-reality gap between EE and action

The widespread attention given to environmental issues gives the impression that we are close to 'solving' all the identified problems. Yet, despite access to exponentially increasing environmental information compared to past decades, there have not been many impactful actions to limit the ongoing damage to the environment. Stevenson (2007) points out that formal educational systems have not been designed to promote *transformative actions*, as they were originally conceived as social structures to *transmit* cultural beliefs and cumulative knowledge gained by the society. Environmental education, on the other hand, requires questioning dominant cultural beliefs, and developing alternative *practices* that are ecologically sustainable. This puts the aims of EE at odds with the general aim of schooling. As philosopher Michael Bonnett comments:

"Despite the truistic ring today of our admonishments to take account of the environmental consequences of our actions, the way to achieve this is often bedevilled

by highly contentious matters both of fact and value and consequently by diverse views on how to proceed and what our ultimate goals should be" (2004, p.3).

The complexity of EE stems from the systemic nature of environmental problems, which cuts across disciplines, values, societal norms and market forces. This means reductionist and simplistic causal approaches cannot provide solutions to environmental problems. Rittel and Webber (1974) term such problems, which have inherent complexity and no consensus exists regarding their definition and solution, 'wicked problems'. Most environmental problems are now classified as being 'wicked', due to their contentious nature, competing interests, trade-offs, ethical dilemmas and systemic features (Blackmore, 2007). Krasny and Dillon (2013) comments that the field of EE itself might be viewed as a wicked problem, given the wide-ranging issues and questions that can fall under the purview of EE. She argues that models focusing on knowledge and attitude are poor predictors of contingent environmental behaviours.

Given this complexity, an information-deficit model of learning, and 'patching' environmental topics to existing disciplinary content, is not the right approach to EE, as it can do little to engage with the complexity of problems, or develop skills required to act in competent ways (Almeida & Cutter-Mackenzie, 2011; Ashley, 2000; Bonnett, 2013).

1.4.1 Critique of information-based EE

The currently dominant view of the environment is object-centered and compartmentalized, which foregrounds the idea of Nature as a resource that is in need of better management (Capra, 1982), rather than the view of Nature as a living web of inter-relationships in which our lives are embedded. The notion of embeddedness

requires encounters with the world that hold possibilities of a reciprocal relationship with Nature, rather than a one-way relationship of exploitation, which derives from the logico-deductive worldview of Nature as passive entities awaiting investigation. Research suggests that presenting environment-related information to people does not readily provide opportunities for constructive engagements at the ground level. Further, such information-oriented approaches do not enable people to form an empowered community, and participate in environmentally sustainable behavior, based on tangible outcomes (Chandrasekharan & Tovey, 2012; Kollmuss & Agyeman, 2002). Broadly, the literature suggests that information-based EE falls short of addressing the following issues:

a) Lack of direct cause and effect relations: Most ecological problems are temporally and physically distant, thus precluding an immediate feedback (such as impact of deforestation on climate change, use of fossil fuels on global warming, ocean acidification, use of pesticides on insect population). The connections between individual actions and the global scale of issues are difficult to make, and the added complexity of economic inequity changes the stakes for the groups involved. For instance, marginalized communities, which suffer from the consequences of the consumerist lifestyle, are more often than not removed from this lifestyle of others, which is the sphere of influence or action (Jackson, 2015). The physical distance between the sites of environmental degradation and consumers creates cognitive and emotional disengagement, and this leads to stakeholders trivializing environmental issues. At the other extreme, stakeholders who engage with environmental issues feel helpless in the face of the global and overwhelming nature of the problems. Both these positions block concerted positive action towards solving environmental problems.

b) Cognitive dissonance: Engaging in pro-environmental behaviors often requires going against the current of established practices, which exerts a cognitive load on the individual, who has to disengage from 'default' behaviors that run on autopilot, and intentionally deliberate over their choices. Pichert & Katsikopoulos (2008) show that many environmental choices depend on the default option available to an individual, because of the cognitive difficulty in performing trade-offs and reconciling conflicting objectives (such as saving money on cheap fuel or going for greener options). Additionally, environmental problems are usually highlighted in ways that evoke guilt or anxiety, rather than in ways that promote willingness or interest to engage with the ideas. It is well known that humans are equipped with a multitude of psychological tactics to suppress thoughts about anxiety-ridden situations, which ironically leads people to avoid difficulties where action is the most needed (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Lazarus, 1991; Zeidner & Endler, 1996).

c) Lack of control over outcomes: Hardin (1968) famously argued that "individuals who pursue their own self-interest will over-consume shared resources and thus betray the long-term interests of the group". This phenomenon, termed 'Tragedy of Commons', is considered the psychology underlying the over exploitation of common resources such as forests, oceans and air. The issue is made complex manifold by the invisible nature of resources (Chandrasekharan & Tovey, 2012) and the lack of feedback or perceptible impact from one's actions. For instance, one person opting for public transport, or not throwing garbage indiscriminately, does not seem to make much impact when the environmental problems are described at global scales, such as climate change or groundwater pollution. The connection is neither straight-forward nor

convincing. In such cases, the ‘locus of control’ seems far removed from the individual, which prompts questions such as, “what difference would my actions make?”. The accompanying feeling of apathy and resignation forms a negative feedback loop (Cleveland, Kalamas, & Laroche, 2005; McCarty & Shrum, 2001).

The challenge thus is in motivating people to positively engage with environmental problems, particularly by creating a space for environmentally sustainable actions.

1.4.2 The uncomfortable positioning of EE within Science Education

The placement of environmental issues within the discipline of natural science further complicates the priorities for action, as the emphasis shifts to the truth or, falsifiability of claims (such as global warming, climate change), instead of questioning and changing the practices engendering such phenomena. Historically, environmental concern and awareness in the United States, for example, developed from the work of prominent scientists, such as Rachel Carson. In addition, early work in the field was done by researchers using scientific methodologies (Hungerford, Peyton, & Wilke, 1980; Hungerford & Volk, 1990; Lucas, 1979), which also promoted the subsequent incorporation of EE within science. Topics pertaining to the environment are now predominantly couched within the scientific discourse, which attempts to reduce the complex interconnections into compartmentalized topics for seemingly objective scrutiny and inquiry. A consequence of this categorisation is that the ideology of science overshadows the inherent tensions and complexities of EE (Blum et. al, 2013). Several scholars contend that the positivist, objective, and reductionist views of science contradicts the moral stances crucial for environmental practices (Ashley, 2000; Hart & Nolan, 1999; Hodson, 2014; Nandy, 1988). This discourse privileges forms of knowing that are inadequate to address Nature's 'epistemological mystery' (Bonnett, 2007). The process of reducing the environment into isolated entities strips phenomena from their

contexts, as well as their interaction and interdependent relationships with the environment they are part of. Bonnett (2002) argues,

"Generalized causal explanations and scientific 'laws' say nothing about the sheer existence of natural things—give no insight into the experience of their individual standing forth in their suchness and their ability to affect us in unique and never wholly predictable ways."

Intellectual distancing of actions from reasoning, considered a virtue in science, creates inherent conflicts in the environmental education discourse, where appropriate actions need to stem as a natural outcome of the educational process. Secondly, equating formal science-based environmental knowledge with the knowledge for EE delegitimizes forms of knowing that are implicit, experiential and context-based, as elaborated by studies of diverse indigenous communities (Abram, 2012; Bird-David, 1999; Ingold, 2000). Dominant forms of science education focus on nurturing *scientific attitudes,* characterized by rationality, hypothesis and experimentation, rather than *attitudes towards science* which can be extended to attitudes towards the environment. The latter encompass affective experiences and motivations, which are rarely seen as important concerns while approaching a topic (Alsop & Watts, 2003; Raveendran & Chunawala, 2015). Far reaching consequences of affective dimensions have been studied by Chawla (1999), who interviewed 30 environmentalists and found that their careers were shaped by significant experiences, such as extensive camping and witnessing wildlife destruction, which led to emotions that motivated them to take up the cause of environment seriously. More broadly, studies in education have noted the role of motivation in hindering or supporting learning trajectories (Alsop, 2005; Hidi & Harackiewicz, 2000; Krapp, 1999; Simpson, Koballa, Oliver, & Crawley, 1994).

The required primacy of action to address environmental issues calls for conceptions of

EE that are different from science education, where due emphasis is given to the conative and affective domains of the human mind. This view is supported by researchers arguing for a critical perspective of science curricula, challenging its image as being value-neutral and 'pure', untarnished by conflicting interests (Aikenhead, 1996; Allchin, 2001; Longino, 1983). These debates have helped EE research move away from information-processing models, and recognize the interplay of knowledge, social structures and motivation. For instance, Hart (2002) comments:

"Environmental education is about the construction of ethical awareness that includes critical understanding of one's deep, perhaps contradictory, and inconsistent, personal knowledge structures and beliefs, recognition of personal assumptions, predispositions and biases, cultural blinders, and ideological boundaries" (p. 1248).

1.4.3 The need for action-oriented approaches in EE and evidence-based theory

Recognising the interdependency of social, psychological and cultural factors, recent approaches to EE emphasize the primacy of action-based approaches (Almers, 2013; Barrett, 2006; Jensen & Schnack, 1997; Percy-Smith & Burns, 2013), although there is lesser consensus regarding *how* to motivate actions. The general agreement on the need for physical participation in the local environment has been problematised by scholars questioning the assumed uniformity, access and transformative potential of the prescribed participation (Lotz-Sisitka, 2002; Lotz-Sisitka & Burt, 2006; Lotz-Sisitka & O'Donoghue, 2008). In order to build a critical understanding of the nature of participation, researchers have argued for a focus on specific actions stemming from conscious decision-making, rather than abstract conceptions of behaviour-change. The latter are deemed unstable, given the lack of context, which raises the risk of falling

back into 'old ways' when external conditions change (Lindenberg & Steg, 2007). However, from a different vantage point, other researchers have been critical of a 'decision-making' approach towards action, instead contending for the central role of affective experiences in shaping desired outcomes of a given scenario (Alsop, 2005; Bai, 2004, 2012).These arguments show that apart from concerns regarding mainstream EE ideologies, there is a need for theorisation to account for peoples' ways of thinking and valuing different practices, and the way action is connected to these, to help in designing impactful interventions.

1.5 Directions from successful community-based pro-environmental practices

In contrast to the uninspiring track record of formal EE in promoting actions that support the environment, many initiatives to foster pro-environmental action have been developed at the grassroots level in recent years, some of which are summarized below. While many such initiatives have been covered by the media, the design process of such initiatives haven't been studied with the aim of developing policy level changes to support EE. Such initiatives also haven't been analysed from the viewpoint of individual motivations and the processes involved in sustaining, as well as expanding, community[1]-based interactions. An understanding and appreciation of the social and cognitive mechanisms underlying such initiatives could help seed similar interventions as part of EE. My research contributes to developing a detailed characterization of such a community-level practice, which could help formulate EE policies grounded in this data and its associated model.

[1] Community here refers to an ensemble of people engaged in collective activities.

a) *Mathrubhoomi* SEED - SEED (Student Empowerment for Environmental Development) initiative is a novel project in the state of Kerala, India, started in 2009 by the regional language newspaper *Mathrubhoomi* newspaper. With a broad aim of seeding sustainable projects, volunteer employees from the newspaper coordinate with students and schools interested in starting projects such as energy conservation, organic farming, supporting local biodiversity etc., and provide all round support for the success of the projects. The initiative began with a number of small projects undertaken by students and schools. It is now a state-wide movement involving citizens' participation in growing local food, protesting industrial pollution and reviving indigenous plants (Amrutha Sebastian & Ajith, 2013; Ram & Pereira, 2014).

b) *Anand Niketan* community school- Anand Niketan is a school located in Sewagram, India. It started in 2005 as an institution based on Gandhi's educational philosophy (Gandhi, 1980; Sykes, 1987). Gandhi's approach to education, *Nai Talim*, emphasizes the holistic development of the body, mind and spirit. It has a strong orientation towards life skills, and the pedagogical foundation is learning by doing. Farming, cooking, and fabric making are major engagements, which primarily deal with the basic necessities of human life and also provide a wide range of learning opportunities to children. These activities have led students to assume ownership of the place and community. Consequently, issues pertaining to garbage disposal, waste management, pesticide usage and water availability are not just in the sphere of theoretical knowledge, but involve active engagement with tangible outcomes in nearby villages. In recent years, many educators have started alternative schools in other rural areas, based on their experience and interaction with Anand Niketan.

c) Green Bronx Machine[2] – Green Bronx Machine is an organization founded by educator Stephen Ritz. It originally began as an after-school alternative program for high school students in a poor neighbourhood of New York City. The idea was simply to grow local food in response to the alarming levels of obesity and malnutrition in South Bronx. However, it soon grew into a movement with tremendous community participation, converting vacant plots into edible food gardens, and engaging with issues of food security, senior citizens healthcare, local jobs and much more. Today, Green Bronx Machine has evolved into a K-12+ model fully integrated into the core curriculum, and is finding its way to other city schools.

1.5.1 Direction of the thesis

These initiatives illustrate the diversity of issues that have been tackled though local participation, and how the resulting practices have helped the community move in the direction of environmental sustainability, even if this wasn't the initial focus. Numerous such initiatives are now documented across the world, serving as powerful examples of human-environment interactions that can replenish nature and build communities (Solnit, 2010; Tidball & Krasny, 2011).

It is interesting to note that a common practice underlying many of these initiatives involve some engagement with the land, in the form of farming related activities. This is not surprising given that farming has often been described as the "largest interface between humans and environment" (Vries, 2012, p. 339). Based on this general pattern, I thus chose farming as a study domain, and sought to characterise the practice elements of community-farming in depth (for a detailed discussion, see Chapter 3). A food garden, by virtue of its elements and their relationships, embeds many action

[2] More information about this initiative can be found here: https://greenbronxmachine.org/ . URL last accessed on 27 June 2020

possibilities, to understand principles (such as interdependence) and ideas (such as recycling) related to the environment. When done as a community, farming and harvesting food from the garden would allow for many related discussions and motivations to come to fore, as would the regular tending and care of the living space. The 'transformative' (Sterling, 2001) potential of such practices were of central interest, in terms of perspective-level changes generated in participants. This is a context-driven process of learning, which is affirmed by theories of situated cognition, where the importance of context in learning through participation within a community is highlighted (Lave & Wenger, 1991; Rogoff, 2003). The emphasis on 'action-competence', rather than knowledge, provides elements of embodied learning and intrinsic motivation, which are otherwise missing from the conventional approach to environmental education (Chawla, 2008; Chawla & Heft, 2002; Rathunde, 2009).

1.6 Focus of the thesis

My encounters with scholarly writings and actual practices in the field have made clear the complex connections underlying EE. The initial motivation to work in this area emerged from trying to understand the paradox between increased information and desensitisation regarding human actions and their environmental repercussions. My work is directed by a broad concern regarding the characterisation of our relationship with nature, and how it informs a gamut of actions, belief and knowledge about the world. Primarily, my research is broadly motivated by the following questions:

1) How do pro-environmental actions (PEA) emerge?

2) How can we design interventions that can facilitate PEA?

I have attempted to engage with these questions by drawing from literature in

environmental and moral philosophy, embodied cognition, and socio-cultural theories of motivation and action. In order to develop alternatives to information-based EE, I have sought insights from different community-level interventions that have had a transformative effect on environment-related issues. In the process, I identified community-farming as a powerful tool to engage and support pro-environmental actions. More specifically, I have examined how individuals become motivated to participate in environmental activities, even if they begin with pragmatic considerations. Further, I have used the initial findings to design an educational intervention and analyse the outcomes of the project.

The structure of the thesis is as follows – Chapter 2 examines action-based approaches in EE research, and discusses existing literature in research to motivate PEA. Chapter 3 explains the research approach and broad research questions. In Chapter 4, detailed descriptions of the methodology and research design used to carry out phase I and II of the study is presented. Chapter 5 describes the data from the phase I study. Chapter 6 discusses an enactive model of motivation based on dynamic interactions with the environment. Chapter 7 describes the terrace farm intervention, implemented in a suburban school. Chapter 8 presents the perspectives of teachers regarding the terrace farming project, and its implications for including such interventions as part of school curriculum. Chapter 9 extends the proposed model on motivation based on responses gathered at the school. I conclude the thesis with implications, and directions for future work (Chapter 10). The diagram below indicates the main themes discussed in the thesis.

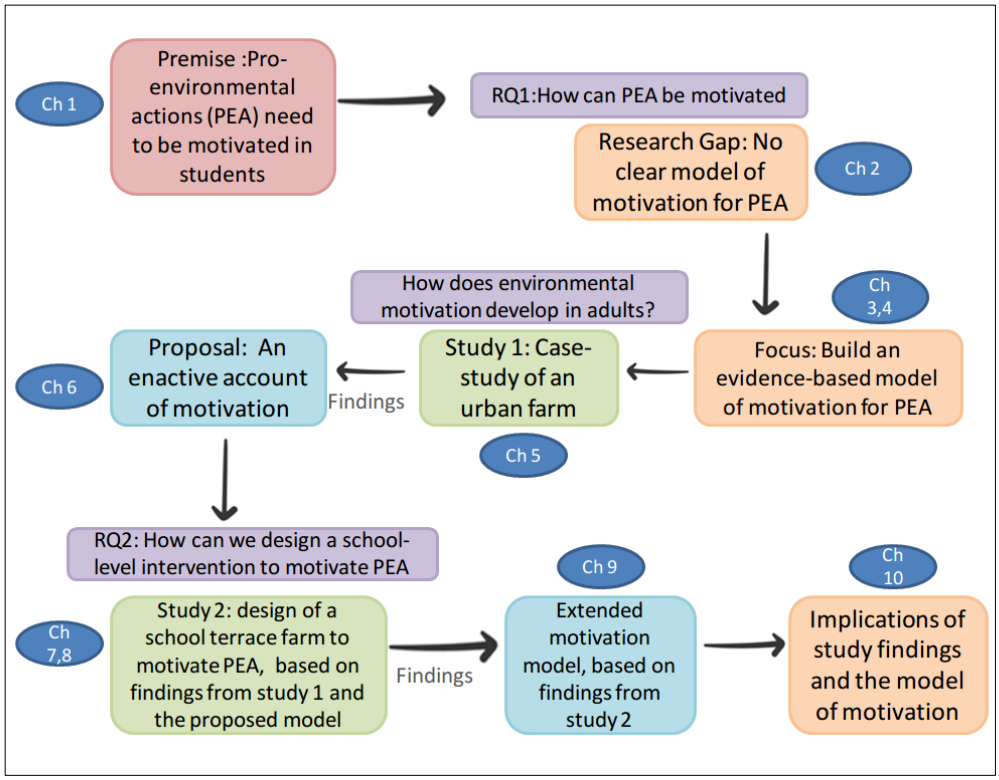

Figure 1.1: A diagrammatic representation of the thesis

1.7 Personal journey

As a child growing up in a metropolitan city in the 1990s, I found 'environment' to be a loaded word. School books were filled with bleak scenarios of widespread extinction, global warming and ozone depletion. But the 'solutions' portrayed seemed too good to be true. As Leopold comments, “In our attempts to make conservation easy, we have made it trivial” (1993, p. 337). In short, it remained a mystery as to why all these 'big' problems weren't getting solved if we are all 'doing our bit'. On the other hand, personal experiences and local problems never figured in classroom discussions or practices.

I read about oil spills in the far-off Pacific Ocean and felt helpless about the situation. I felt equally clueless on how to engage with severe water contamination in our locality, because sewage pipes were leaking into the groundwater supply. We had to go days without water to bathe and cook, with the occasional relief provided by a water tanker,

after standing in a long queue to get a couple of buckets. There was a wide gap between experience, information and expected action. However, I had no means to form these connections. I dutifully participated in the school's nature club, where we would religiously celebrate Earth day, Nature day and so on with poster making, debates, occasional sapling planting ceremonies and so on, but the unspoken divide remained. What did my standing in queue for water have to do with 'Save the Tiger' posters? How were my tiny efforts to avoid the use of plastic bags going to save that bird from choking on garbage? I was not alone in these thoughts. As environmental efforts were always portrayed as individual decisions and actions, contradictions in thought and practice remained; only I got used to it as I grew up.

There was also the idea of a distinct nature far from human intervention, through media portrayal of pristine places that were 'natural' and scenic. A similar trend was seen in school books, which have different chapters on 'wildlife and forests', with chapters on 'pollution' showing human intervention as primarily exploiting and destroying the environment. Ironically, human intervention was also seen essential to 'development', as depicted through information regarding dams, power plants, architectural feats and likewise, with natural 'resources' meant primarily for human utilization. In the midst of all this conflicting information, imagery and ideas, we were expected to do everything we can to 'Save the Earth', as an ultimate form of altruistic action.

Even years later, 'environmental action' remained a conundrum for me. Chance encounters led me to visit a school in Wardha, Maharashtra, where I observed students participating in farming as part of school activities, along with related engagements of cooking food, measuring harvest and so on[3]. Interestingly, none of them felt they were doing anything special *for* the environment by growing vegetables at school or home,

[3] The visit was part of my field study titled *An exploration of ecological sensibilities in school education— analysing its reflections in the NCERT science textbooks, and understanding some initiatives and practices* carried out as part of MAEE at TISS.

taking measures to save water, keeping weather records or learning skills to lead an ecologically sustainable lifestyle. Rather, their answers indicated that they saw the direct relevance of these activities in their life. In other words, they didn't see a distinction between their own well-being and the ecosystem they were a part of. Discussion of local issues, and corresponding group activities, provided tangible feedback from their participation, as well as different contexts to explore their relationship with the environment. The time spent in this school brought to fore old dilemmas and questions of better alternatives. Books such *The Unsettling of America* by Wendell Berry (1977), and *Braiding Sweetgrass* by Robin Wall Kimmerer left deep impressions on me, and provided much of the inspirational rudder to guide my research questions. Kimmerer writes, "we can't meaningfully proceed with healing, with restoration, without 're-story-ation'" (2013, p. 9). Following these ideas, my research is an attempt to explore new narratives, and ways to think about our place and identity as beings within an ecosystem. My work has also been a personal journey to understand how I relate to nature, and its implications for my beliefs and actions.

Chapter 2 Literature Review

The need for evidence-based linkages between environmental experience, motivation and action

"It is no longer possible to deal with environmental issues in isolation from the attitudes and assumptions that precipitated them in the first place."
— *Neil Evernden (1999)*

In this chapter

The chapter has two main sections. In section 1 (2.1), I review prominent action-centered approaches to EE, and the contexts of their implementation which suggests that while the importance of salient experiences is acknowledged in the EE literature, the linkages between PEA through student actions have not been explored in sufficient detail. Extending this discussion, I briefly examine some philosophical issues related to pro-environmental interventions, particularly the assumptions they make (2.2). In section 2 (2.3), Ifocus on research in motivation and cognition, and highlight a gap in our understanding of motivation processes, particularly the way pro-environmental motivations emerge from related practices. Based on these discussions, I outline the need for understanding the motivational process as *situated* and *embodied,* with respect to one's environment (2.4). I then scope my thesis project within existing questions in this field (2.5).

2.1 Action oriented approaches to EE

The critiques of information-based EE (briefly described in the previous chapter) have led to a revival of debates regarding the fundamental nature of EE. Robottom and Hart (1993) outlines three possible orientations for EE: positivist, critical and interpretive.

The positivist approach is focused on a science-based creation of knowledge about the environment, followed by systematic dissemination of this information. Critical approaches argue for education *in* and *for* the environment, giving primacy to pro-environmental actions. Interpretivist approaches take a more equivocal stance towards active participation as being the main aim of EE. Canadian educator Lucie Sauve expands the paradigms into 15 distinct currents (Sauvé, 2005), highlighting the diversity that has come to characterise EE. The currents are: naturalist, conservationist/resourcist, problem solving, systemic, scientific, humanist-mesological, value-centred, holistic, bioregionalist, praxic, socially critical, ethnographic, eco-education and sustainable development/sustainability. These approaches describe educators' attempts to reconcile different assumptions about education, environment and sustainable development. However, as Joanne Nazir (2013) comments, "EE is a field with a rich and complex theoretical life that is continuing to grow as scholars from diverse theoretical orientations continue to take it up. However, this rich theoretical life is neither reflected in mainstream practice nor in the teaching and learning of EE (Rickinson, 2001). Indeed, mainstream EE continues to be dominated by certain paradigms" (p. 195-96).

Moving away from science-based information paradigms, educators now emphasize more explicitly the role of motivations and actions. For instance, Jensen and Schnack (1997) posit an action-competence model for EE. This model argues for immersing students in situations that require active-participation and problem-solving, such that they receive authentic feedback for their efforts. Through this model, the authors also seek to distinguish actions from activities, as well as behaviour change approaches, which, according to them, is a piece-meal attempt at engaging with environmental issues. In a similar vein, Eco-critical EE (Bowers, 2002; Kopnina, 2012; Wals & Jickling, 2002) treats knowledge as contextual and socially-constructed, rather than as a

value-neutral, fixed entity requiring passive assimilation. One of the assumptions made here is that critical inquiry and knowledge would form the basis for socio-political actions. However, this idea has been critiqued for leaning too heavily on the knowledge-to-action model, while neglecting motivational and affective components of sustained practices (Payne, 1999; Nazir, 2013). The eco-critical paradigm advocates reframing of environmental problems to fit local situations, and active participation in constructing problem-statements, as well as solving them. Nevertheless, as Nazir (2013) notes, action possibilities are still assumed to stem from rational decision-making and evaluation of a situation, and this exercise is equated with affective orientation. These assumptions have been critiqued by feminist scholars such as Gilligan (1993) and Noddings (2013), who have argued for actions based on 'care', and experiences that evoke empathy. An orientation towards care emphasizes the themes of attachment, connection, and responsiveness, of human beings with others. This care-based orientation requires moral problems to be seen as issues of inadequate or incorrect response to existing relationships. Thus, rather than being based on abstract principles, care-based approaches tend to be highly contextualised and non-individualistic in nature. Haraway (1997) uses the idea of 'response-ability' to emphasize the relational character of such ethical actions. Postma (2006) extends Nodding's position of care to practical involvement with the natural environment, and discusses ways of experiencing the reciprocity of a relationship with nature, rather than assuming the incomplete vision of natural resource management.

2.1.1 Place-based Education

Within the eco-critical paradigm, place-based education (Gruenewald, 2004; Smith, 2002; Sobel, 2004; Woodhouse & Knapp, 2000) has become popular, with its emphasis on 'rooting' experiences within local areas. However, the idea itself dates back to

educators such as Gandhi (Sykes, 1987), Dewey (1986) and Leopold (1989), who argued for education relevant to immediate geography. The interest in place-based education from an environmental perspective is, however, more recent. For instance, Thomashow (1996) argues that, “People are typically interested in understanding who they are in relationship to where they live. By exploring the places that are most important to them, they are most likely to take an interest in the human and ecological communities of those places” (p. 76). 'Sense of place' has been seen as consisting of four dimensions, namely, the biophysical, psychological, sociocultural, political, and economic realm (Ardoin, 2014). These factors lend a more dynamic quality to the idea of place, and the interconnections need to be better understood in order to develop interventions for EE. For instance, many scholars have explored 'sense of place' in terms of place attachment and place meaning. Place attachment refers to the relationship people develop with a particular location, and it can extend to place identity, wherein people identify themselves with some characteristic quality of the place (Altman & Low, 2012; Farnum, Hall, & Kruger, 2005; Hauge, 2007; Stedman, 2003). Place meaning refers to symbols that are ascribed to particular settings by people. It can be defined by asking descriptive questions about the place (Davenport & Anderson, 2005; Jacobs &Buijs, 2011). Many environment educators seek to foster pro-environmental actions by nurturing a sense of place, though there is need for more research on how this could be done effectively, especially when dealing with changes related to rapid urbanisation. Kudryastev, Stedman and Krasny (2012) suggest direct, positive and sustained engagement can help develop place attachment, wherein the nature of the engagements would help in imbuing the environment with meaning. In such studies, “Why is this important for me”, and “What can I do to ensure the integrity of this place” can become drivers of pro-environmental actions. These questions also gain salience through community interactions, though the process is not well-

understood. Raymond, Kytta and Stedman (2017) argue that the sense of place scholarship hasn't given adequate attention to the role of instantly perceived sensory-based meanings, and assumes a linear relationship between place attachment and behaviour (instead of exploring the dynamic relations between body, environment and culture).

2.1.2 Civic-Ecology Initiatives

Ideas of civic ecology have extended the focus of place-based education to environmental practices within a community. Civic ecology emphasizes hands-on stewardship practices that integrate civic and environmental values (Krasny & Tidball, 2010). In an attempt to challenge the 'humans apart from nature' perspective, civic-ecology focuses on actions taken to enhance the green infrastructure and community well-being of human-dominated systems (Krasny et al., 2015). Initiatives typically focus on engaging students in stewardship practices that need community engagement with local civil assets (such a water body, parks, farms etc.). Civic ecology initiatives are driven by the principle of viewing humans as nested within, and capable of positively impacting, communities and ecosystems. Krasny, Russ, Tidball, & Elmqvist (2014) characterise civic-ecology practices as emerging in broken places (such as neglected water bodies, neighbourhoods), where some community members begin with restorative work, to reclaim and recreate better spaces. They have documented many case-studies to argue that such practices foster well-being and provide opportunities for learning (across a wide spectrum, involving formal and “know-how” knowledge). Such practices have also been observed to begin as local, small-scale initiatives and gradually expand in scope and partnerships. These studies highlight the socio-ecological character of the practices, in terms of how individuals dynamically shape, and are shaped, by the ecosystem they are a part of. Understanding the processes underlying these principles

can help seed such practices in different communities.

2.1.3 Outdoor Education

Outdoor education (OE) is a broad term, encompassing a range of activities taking place outside the confines of closed school and other spaces. Traditionally, OE was characterised as a form of fitness training, but it gradually included other skills needed for survival in wild terrains(Adkins & Simmons, 2002; Brookes, 2003; Loynes, 2013; Passmore, 1972). The development of OE as an educational intervention is largely credited to initiatives by Kurt Hahn (Flavin, 1996), a German-Jewish educator who escaped Nazi atrocities, and later founded institutions such as Outward Bound, which remains active today. He believed that OE could provide ample opportunities for mental and physical growth, through participants engaging with situations that require collaboration, compassion, and healthy competition. In his view, education in controlled classrooms did not provide such contexts for learning.

OE later became an integral part of EE, after studies (D'Amato & Krasny, 2011; Dunlap & Heffernan, 1975; Larson, Whiting, & Green, 2011) correlated positive experience in nature with pro-environmental attitudes and actions. However, OE has also been criticised for lacking a coherent perspective, to explicitly nurture pro-environmental actions. For instance, Loynes (2002) argues that in OE, "…nature is understood as an assault course, gymnasium or puzzle to be resolved and controlled. It is a resource to be commodified, instead of a home to which to relate" (p. 3). Gough (2009) extends this argument, commenting that OE has simply treated the environment as a medium, rather than as an active subject of contemplation and concern, and thus OE cannot be seen as an effective EE intervention.

Other researchers have questioned the efficacy of 'direct' experiences of nature as resulting in positive learning about the environment (Barrett, 2006; Russell, 1999;

Russell et al., 2013). Such debates reflect the many theoretical assumptions underlying EE, which, when critiqued, lead to unsettled philosophical questions, particularly related to what constitutes a human-nature relationship, and what constitutes a salient experience seeding further actions. I will revisit these questions in detail while reflecting on the outcomes of my research interventions.

2.2 Being in the world – The corporeal turn in EE

The significance of direct experience is a common theme across different initiatives focusing on pro-environmental actions. However, there are conceptual differences in the notion of experiential education, which make it a contested terrain. Roberts (2008) for instance, identifies four variations in existing experiential education approaches: interactive experience based on pragmatist philosophy, embodied experiences drawing on Romanticism and phenomenological traditions, experience as praxis developed from critical theory, and a 'neo-experiential' approach that he argues can use certain experiences to maintain narratives of economy, control and efficiency. Roberts (2008, p.33) concludes by noting that ‘for those who believe in the transformative power of experience in education, there is important work yet to be done’. Some environmental educators have argued that transformative experiences aimed at nurturing PEAs must disrupt the pervasiveness of reductionist Cartesian ontology, which is involved in the 'othering' of nature-based interactions (Bai, 2015; Bonnett, 2004; Payne, 1999; Payne, 2016). For instance, David Abram (2012) comments: “To define another being as an inert or passive object is to deny its ability to actively engage us and provoke our senses; we thus block our perceptual reciprocity with that being. By linguistically defining the surrounding world as a determinate set of objects, we cut our conscious, speaking selves off from the spontaneous life of our sensing bodies” (p. 56).

From an education standpoint, Dewey asserts the inseparable nature of learning and experience, by conceptualising the latter as a 'transactional' process constituted by 'trying' and 'undergoing'. He defines trying as ways in which the individual tries to express oneself in the environment, and undergoing as the accompanying changes in the environment itself (as perceived by the individual). He argues that these processes are intrinsic to learning, and can't be thought of as abstract reflections happening in isolation (Ord & Leather, 2011). In this thread, there is strong encouragement to experience the world through corporeal encounters, and invoke animistic ontologies of relationships. Drawing on works of Bird-David (1999), Harding (2006), Descola (2013) and Ingold (2000), Clarke and Mcphie (2014) define animism as "a mode of being (becoming) that embodies both 'seeing' and 'acting' within a world ontologically understood by its inhabitants (animists) to be constituted by immanent materiality; to be whole, alive and forever becoming" (p.2). Scholars like Bai (2015) and Bonnett (2015) have argued that sensuous perception of the world allows for responsive sensitivity, and this has ethical implications for knowledge and action. Scholars from other fields, such as Bennet (2009) appeal to actions emanating from moments of raw wonder or 'enchantment' such that "the affective force of those moments might be deployed to propel ethical generosity" (p.3). There is thus a significant confluence of affective, and motivational aspects in construction of a transformative experience. Understanding, analysing and, developing practices that constitute aforementioned qualities of experience in EE literature is, however, scarce (Chawla, 2008; Reid, Payne, & Cutter-Mackenzie, 2010). The next section explores existing research in pro-environmental motivation and action.

2.3 Understanding PEA based on motivation and cognition

Motivation is closely linked to action, and hence understanding motivational processes that lead people to take pro-active roles in environmental issues forms an important area of research in EE. Much of the environment-oriented research in this domain aims to understand factors that promote or hinder pro-environmental actions (PEA). The focus has also largely been on individual actions, rather than concerted efforts at the community level. As discussed in the previous chapter, the early models of environmental actions argued for a linear relationship between knowledge, attitude and action. However, observations indicate that the relationships between these elements are more complex and non-linear. Revisions to the early models continue to assume that behaviour is the culmination of decisions made by rational individuals, and is essentially a cognitive exercise of choosing between available choices and calculating the consequences. However, the growing literature in the fields of emotions, motivation has led some researchers (Bamberg & Möser, 2007; De Groot & Steg, 2009; Steg & Vlek, 2009) to explore the roots of PEA through frameworks of empathy, altruism and pro-social behaviour.

In current theory, motivation is considered to be a construct that manifests in behaviour, and further drives selection, direction and completion of particular goals. The ubiquitous nature of motivation, which has been found to underlie diverse human behaviour, has led to many theories of motivational processes. Broadly, the emphasis has been on understanding personal factors such beliefs, norms, and goals, along with situational factors that contribute to different kinds of motivation (such as power, achievement, and affiliation motives) becoming salient (Lokhorstet al. 2010; Miao & Wei, 2013; Schultz, Oskamp, & Mainieri, 1995).

There have also been attempts to group diverse motives into categories seen as 'hardwired' psychological tendencies. For instance, Kovac (2016) contends that “all

aspects of any human action may ultimately be traced back to only three basic motivational tendencies that are related to controlling, belonging and expressing, which in turn comprise of many interrelated need processes"(p.21). However, complex behaviours build on these basic tendencies, through interaction with the environment, and hence there is a need for context-dependent insights into motivational processes.

PEA forms an active domain for motivation research. However, motivational processes are yet to be understood in as much detail as cognition and action. Further, research in the field of motivating PEA have mostly focused on material incentives or penalties to make a particular behaviour salient. Extrinsic motivations have been found to require constant incentives, without which desired behaviours are not manifested (Geller, 2002; Pelletier et. al. 1998). This view creates a more fundamental problem, as it implicitly signals PEA as worth engaging in only if there is material profit, which devalues the entire spectrum of affective and moral concerns.

Researchers have focused on altruistic motives as reasons for pursuing PEA. But in the process, they assume self-sacrifice or readiness for personal impoverishment as a prerequisite. For instance, Schwartz (1992) links environmental concern to more general theories of value. Others (Dietz & Stern, 1998; Greeley, 1993; Kempton, Boster, & Hartley, 1996) have correlated pro-environmental actions with people espousing altruistic ideas. The key notion here is that people who tend to care for others are more likely to engage positively with the environment.

Stern (2000) underscores the difference between intention and impact as independent dimensions of PEA, thus arguing for a spectrum of possible actions (ranging from indirect, private to public) that need to be analysed in greater detail. He proposes environmental concern as stemming from a combination of egoistic, social and biospheric orientations. The Value-Belief-Norm theory, as he posits, links variables

such as attitudes, context, personality and habits to various target behaviours. However, the model doesn't address the evolution of the causal factors, and how it may change through interaction with an extended community. Other researchers have explored possible barriers to PEA, and have described a 'Value-Action' gap (Blake, 1999) where pro-environmental inaction is considered as arising from individual, social and institutional constraints.

Such models, while useful in bringing together diverse perspectives, does not explain how these factors become salient, and how the underlying mechanisms result in these factors affecting overt behaviour. A few researchers have tried to understand the nature of actions through analysing human-environment relationships, rather than considering them as separate entities. A comprehensive overview, to account for external, internal and demographic factors, has also been attempted, but more empirical studies are needed to explore various factors and uncover new variables (Bockarjova & Steg, 2014; Kollmuss & Agyeman, 2002). Studies attempting a causal analysis have been post-facto in nature, where practicing environmentalists were asked about experiences which shaped their positive engagement with the environment (Chawla, 1998, 1999, 2008).

In the next section, I will review some of the major motivational frameworks proposed to describe PEAs, and discuss critical gaps in this work that merit further research.

2.3.1 A cost/benefit approach to PEA

Dominant models to understand pro-environmental actions assume that behavioral outcomes stem from rational evaluation of available choices. The behaviour selected is considered to confer maximum benefits when the costs are lowest. The most influential framework in this domain is the Theory of Planned Behaviour (TPB) (Ajzen & Fishbein, 1975; Fisher & Fisher, 2002). TPB considers behavioral outcomes to be a combination of intention and ability. Intentions, in turn, are shaped by beliefs regarding

the behaviour, social norms, and perceived control over the outcome (as shown in figure 2.1). The framework has been used widely in health and environment psychology studies, to explain recycling behaviour (Kaiser & Gutscher, 2003), composting waste (Mannetti, Pierro, & Livi, 2004; Taylor & Todd, 1995) and travel-mode choices (Bamberg, Ajzen, & Schmidt, 2003; Harland, Staats, & Wilke, 1999; Heath & Gifford, 2002). However, the model has been criticised for its emphasis on rational reasoning, which does not consider nonconscious influences on behaviour, such as attentional bias (Sheeran, Gollwitzer, & Bargh, 2013) and the role of emotions beyond expected affective outcomes (Conner, Godin, Sheeran, & Germain 2013). Moreover, the static, descriptive and linear nature of the TPB does not explain various empirical studies showing the effects of past behaviour on future actions (Sniehotta, Presseau, & Araújo-Soares, 2014).

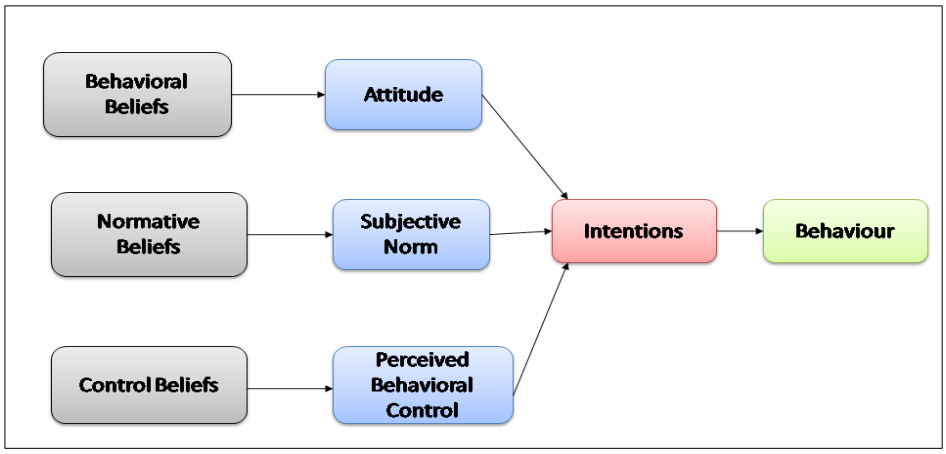

Figure 2.1: Diagram illustrating the theory of planned behaviour, wherein observable behaviour is proposed to be an outcome of a combination of ability, norms and attitudes.

2.3.2 Normative motives for PEA

Many researchers have tried to explain PEA as a manifestation of altruistic concerns. Schwartz (Schwartz & Howard, 1981) developed the Norm Activation Model (NAM)

to describe altruistic behaviour (shown in figure 2.2). Personal norms form the core of this model, and Schwartz argues that these norms are experienced ‘‘as feelings of moral obligation not as intentions’’ (p. 227). These personal norms are used within the NAM framework to predict individual behaviour. The personal norms are determined by four factors: the awareness that performance/non-performance of the particular behaviour has certain repercussions, feeling responsible for performing the specific behaviour, efficacy, and ability (Harland, Staats, & Wilke, 1999; Hopper & Nielsen, 1991). This model has been extended by Stern (2000) to include the influence of values to subsequent beliefs and activated norms. Commonly known as Value-Belief-Norm (VBN) theory, it posits that personal values and beliefs can be influenced by capacities and constraints. Such values play a major role in shaping action possibilities. More specifically, self-transcendent or altruistic values are seen as a strong indicator of people willing to engage in pro-environmental actions. Other researchers have explored environmental concern as a cause for PEA (Dietz, Fitzgerald, & Shwom, 2005; Schultz & Zelezny, 1999; Stern & Dietz, 1994) but it has been observed that concern doesn't translate into action, especially if valued behaviour needs to be significantly altered (such as driving a car vs public commute; giving up air-conditioning etc., despite being concerned about climate change) (Bamberg & Schmidt, 2003; Hunecke, Blöbaum, Matthies, & Höger, 2001). Appealing to altruistic emotions as the cause for PEA, however, reinforces the idea of nature being a separate entity in need of charitable help. Kaplan (2000) has critiqued the altruism-centred approach, for its implication that self-sacrifice is a prerequisite for PEA. The idea also unwittingly legitimises the dominant consumerist lifestyle by portraying it as pleasurable, as opposed to PEA, which requires some form of impoverishment. In contrast, Kaplan argues for a broader conception of self-interest, based on intrinsic motivational drives, to encompass actions related to the well-being of the environment.

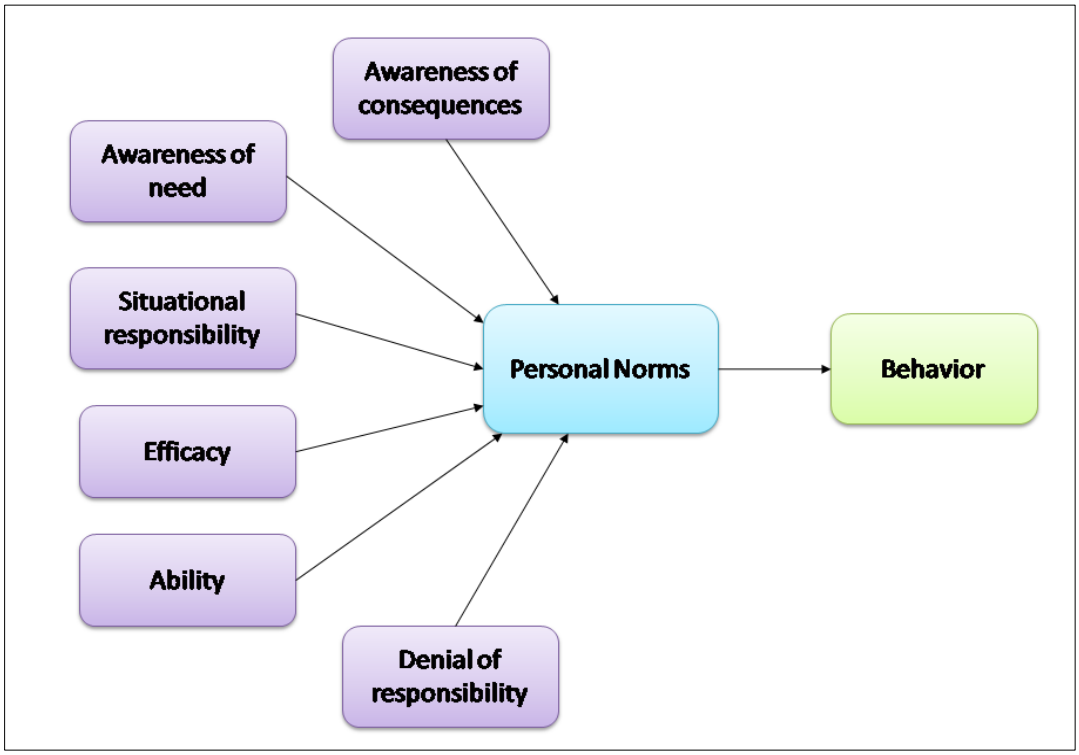

Figure 2.2: Diagram illustrating the Norm Activation Theory, wherein observable behaviour is proposed to stem from personal norms, which in turn can be affected by a number of factors.

2.3.3 Affective motives in PEA

Researchers have also explored emotional needs as playing a dual role in motivated behavior. First, it can serve to reinforce an executed behaviour. Secondly, it can substantially dampen or arouse a desired behavioral outcome (McClelland, 1987). For instance, Steg, Dreijerink, and Abrahamse (2005) showed that individuals for whom a car was related to affective motives were less likely to opt for pro-environmental options. There are relatively few studies exploring the relationship between affect and PEA (De Young, 2000; Lindenberg & Steg, 2007). Combining affective motives with normative views could help in sustaining PEA despite easier options available. De Young comments that people might find PEA, "…are worth engaging in because of the personal, internal contentment that engaging in these behaviors provides" (De Young,

2000, p. 515). Hence, the role of emotional affinity, as well as factors that contribute to positive feelings towards different areas of PEA constitutes an active area of research (Vining & Ebreo, 2002).

2.3.4 Integrative models

Researchers have sought to account for the effects of contextual variables by acknowledging multiple motives to be active at a given time, and the interactions between different motivations and situational variables as resulting in particular behaviour. For instance, in Goal-Framing theory proposed by Lindenberg and Steg (2007), the main idea is that people indulge in goal-oriented behaviour, and the salience of respective knowledge, attitude and other aspects of the situation is decided according to the chosen goal. They broadly conceptualise three goal frames: a hedonic goal-frame (roughly mapping onto affective motives), a gain goal-frame (similar to egoistic norms for self-fulfillment), and a normative goal-frame (based on moral imperatives) as shown in figure 2.3. The authors argue that the hedonic goal-frame has innate biological roots, while norm-based behaviour needs external feedback and support. They further describe values and situational factors as affecting the activation and strength of different goal-frames. While the idea of values as framing the salience of behavioral outcomes has been studied by various scholars (Dietz, Fitzgerald, & Shwom, 2005; Stern & Dietz, 1998), little is known about the conditions under which values *change.* Although, the interaction between situational and personal factors is recognised as an important dimension of PEA, situational factors are yet to be explicitly considered in theories of pro-environmental behaviour change (Steg, Bolderdijk, Keizer, & Perlaviciute, 2014).

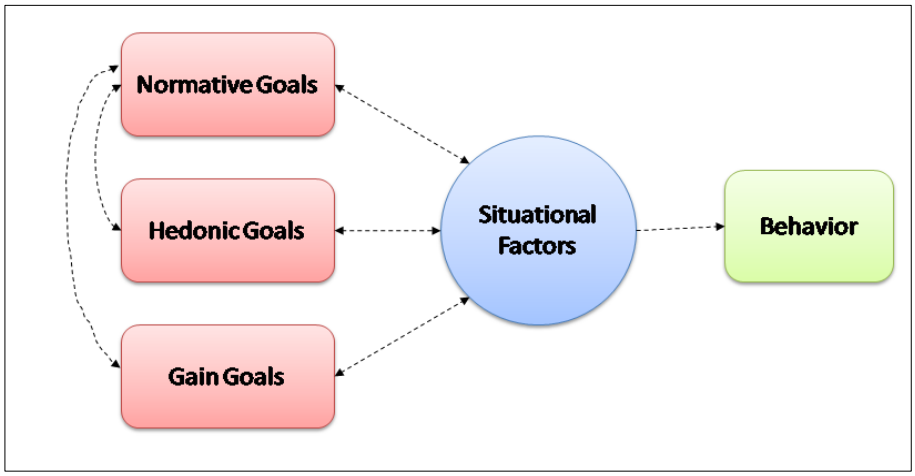

Figure 2.3: An integrative model of behaviour that traces it to interactions between situational factors and different (contrasting or reinforcing) goals.

To some extent, the role of the environment has been considered by Kaplan and Kaplan (2008, 2009) who explore the role of environmental variables to postulate the Reasonable Person Model (as shown in figure 2.4). They espouse an information-processing task environment that encourages people to respond better to a given situation. They argue that people are inherently motivated to accrue meaning from their surroundings, so environments need to be designed such that people are able to process and act on the information perceived effectively. What constitutes supportive environmental structures, and how they interact with the human psyche to result in meaningful action, is currently an active domain of research.

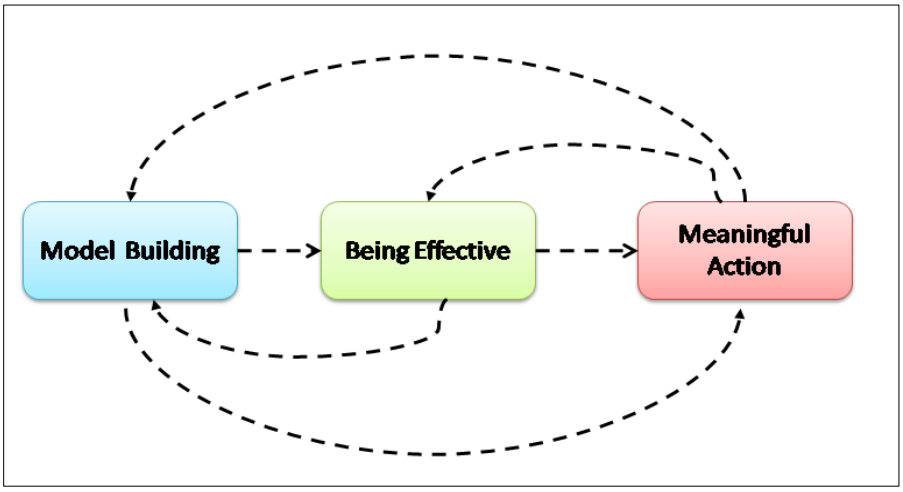

Figure 2.4: Reasonable Person Model, which proposes effective actions in the environment as inherently motivating, and such actions being based on the individual's internal models of the environment. The internal model receives feedback from the actions taken, and its perceived effectiveness.

Self- Determination Theory (SDT) is another prominent theory that proposes basicpsychological needs of competence, autonomy, and relatedness as supporting behaviors to be more self-determined (Deci & Ryan, 2000a, 2000b; Reis et al. 2000; Ryan & Deci, 2000). The sense of competence is related to motives of control, autonomy refers to the need to feel that the origin of the individual's behavior exists within oneself, and the need for relatedness is similar to affiliation motivation. The main idea is focused on using socio-cultural factors to build self-directed norms, which then motivate a range of behaviours. In the context of PEA, SDT thus encourages situations that can promote intrinsic motivation, which is viewed as the strongest form of self-determined motive. As a result, however, contextual factors get downplayed and can even be considered as a hindrance to developing intrinsic motives. Kovac (2016) comments that SDT is normatively-built, emphasizing exclusively on personal factors; it perceives all types of contingent rewards, be it material compensation or social feedback, as potentially in need of being transcended, as they have a diminishing effect on self-determined behaviour. This bias can be presumed to have its roots in the

classical information-processing model of cognition, which downplays the role and effect of environmental variables.

2.4 Exploring motivation as an outcome of dynamic relations

A common thread connecting various frameworks described above is the classical information-processing model of cognition, where a) it is assumed that the mind extracts information from the environment, which encompasses social context, and content, b) various aspects of the environment have an information based linkage and, c) motivation acts on the extracted information to affect goals and action outcomes of an individual. This extractive model is unable to capture the dynamic nature of our surroundings, and the ways in which our relation to it is constantly changing through our actions. Given this underlying structure, the bi-directionality of the causal processes has not been given enough attention in the environmental motivation literature. Heft (2012) illustrates the problem by pointing out the historical neglect of the environment in understanding psychological processes. He writes:

"...environmental psychology adopted the traditional dichotomy between environment and mind as a matter of course from its parent discipline, despite the fact that this framework undercuts what should be environmental psychology's most distinctive contribution. Environmental psychology arose in response to the discipline's long-standing neglect of the environment, which in turn handicapped efforts to ameliorate conditions that adversely affect human well-being, and to explore conditions that promote human flourishing. However, without a clear sense of how to best *conceptualize the environment in ways that are most relevant to psychological functioning*, one is at a loss to know how to best intervene." (p.9)

An attempt to understand the environment as playing a constitutive role in psychological functioning was proposed by Lewin, a Gestalt psychologist, who called it a 'Field Theory' (Lewin, 1942, 1951). He conceptualized behaviour as a function of interdependent 'Person' (properties/ characteristics of individual) and 'Environment' factors, formalised as B = f(P,E). Taking inspiration from physics, he sought to describe fields of forces (positive or negative) existing in relationship with the immediate environment, and its effect on emergent behaviour. The theory also attempted to bring spatial and temporal considerations as part of understanding contingent behaviour. This initial attempt at developing a relational theory of motivational psychology, however, fell short of explaining *how* environmental parameters contribute to individual psychology, and how these internal experiences are shared between people.

These questions have slowly paved the way to examine the role of the body in parsing environmental parameters. The argument for the primacy of body-based experiences in developing pro-environmental sensibilities can be supported by recent theories of situated and embodied cognition, which suggest that sensorimotor interaction is central to shaping one's behaviour and thought processes (Glenberg, 1997, 2010; Glenberg, Witt, & Metcalfe, 2013). In particular, ecological psychology offers a rich platform for understanding individual participation in the environment as a dynamic interplay of actions and perceptions, thus making the body an integral component of cognition (Heft, 2015).

A stronger argument to account for the role of environment posits that cognitive mechanisms are *constituted* through interaction with the environment, rather than emerging as an output of some mysterious symbol-processing by the brain (Chandrasekharan & Tovey, 2012; Pande & Chandrasekharan, 2017; Rahaman, Agrawal, Srivastava, & Chandrasekharan, 2017). Similar interaction-based models

might provide more insight into motivational processes involved in PEA. These theoretical considerations are pertinent for environmental research, where motivating people to act in collaborative, pro-environmental ways, and sustaining these actions, are a major challenge. The following diagram illustrates possible interactions.

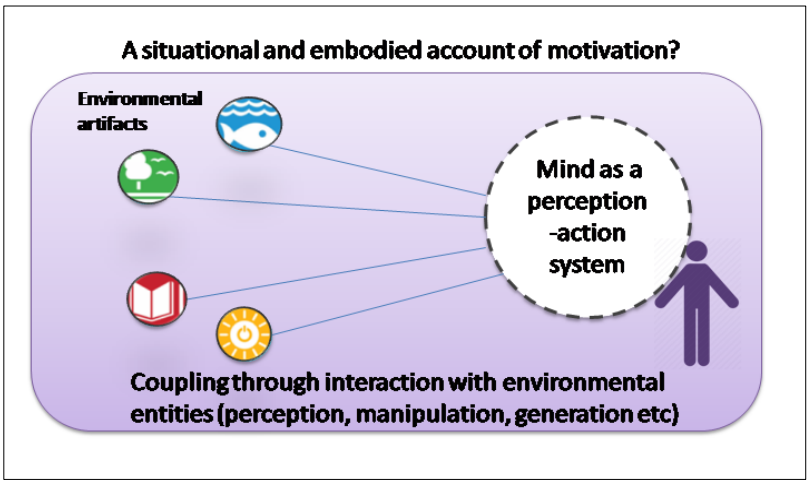

Figure 2.5: Diagram illustrating the possibility of describing motivation as constituted by dynamic, body-based, interactions with environmental entities. Such a model of PEA would have to provide more mechanistic details to account for the emergence of motivation, and how the model could be extended to capture collaborative, group-based actions

2.5 The research gap

In summary, this broad review of literature across various theories in EE and motivation indicate that contemporary models of PEA among individuals recognise the importance of experience and engagement with the immediate environment as an important contributing factor. However, what constitutes a salient experience, and what might be the mechanisms underlying the emergence of motivation through interactions with the environment, remain active areas of research.

Within the canonical approach to EE, even experience-based interventions assume

information processing models of cognition, where actions in the environment are considered to follow from rational deliberation. Similarly, motivational theories of PEA propose a linear model, of 'inner drives' acting on the 'outside environment'. These theories reinforce an artificial dichotomy between the individual and the environment, by neglecting the co-constitutive nature of context, action and motivation. To summarise the findings from the literature review:

- The importance of salient experiences is acknowledged in the EE literature, but linkages with actions (as described in the previous chapter) have not been explored in sufficient detail.
- In the psychological literature, the generation of PEA is not adequately addressed (it is often assumed to stem from ‘static’ factors; situational determinants are downplayed).
- There are very few implementation studies and empirical, process-based accounts.

Given these gaps in the literature, the main questions guiding my thesis project are as follows:

- How do pro-environmental motivations and actions emerge?
- How can we design an intervention that will promote pro-environmental action competencies?

The next chapter outlines the research context and expands these thesis questions in operational terms.

Chapter 3 Research Design

Urban farming as a research domain to understand environmental motivation and action

"Whether a disturbance is bearable or unbearable is a question worked through what follows it: The reformation of assemblages." – (Anne Tsing, 2015)

In this chapter

I describe the rationale for choosing farming as a domain to explore connections between salient experiences, motivation and PEA. Further, I will discuss the context of urban farming in particular, along with its potential to address several environmental issues. Following this, I will elaborate on the questions driving my research and the broad approach followed.

3.1 Reaffirming the 'culture' of agriculture

It is not a coincidence that most community-level pro-environmental practices often have an active farming component, as farming forms the "largest interface between humans and environment" (Vries, 2012, p. 339). As an activity, it has traditionally embodied a world-view of responsible engagement and care of the land, a vision that has been completely corrupted by industrial agribusiness practices. In the words of Wendell Berry, "the crisis of community has its source in the corruption of character." The industrial logic of 'efficiency' has eroded the cultural practices that anchored deep environmental perspectives of farming. The highly skilled and complex nature of farming is based on an understanding of systemic

relationships between the soil, land, weather, plants, insects and animals. In contrast, the logic of industrial-agriculture functions by isolating and manipulating interconnections as input-output parameters. As Wendell Berry (2010) describes a typical cattle farm,

> " To concentrate food-producing animals in large numbers in one place inevitably separates them from the sources of their feed … Confined in the pens of animal factories, they are made dependent almost exclusively upon grains which are grown in large monocultures, at a now generally recognized ecological cost … Animal factories are energy-wasting enterprises flourishing at a time when we need to be thinking of energy conservation." (p. 26)

Efficiency-oriented farming emphasizes highest yields per unit area, and towards this goal, traditional farming has been 'modernized' to use efficient machinery. Ironically, while the quantity of produce increases in the short-term to the exclusion of health of all other beings, Winner (2010) argues that technology has also displaced the very farmers who are envisioned to be beneficiaries of the technology. India has not been immune to the clutches of agricultural modernisation (See Kumar, 1996 for discussion regarding systematic inclusion of high-input technology and displacement of traditional knowledge). Traditional farming systems are based on diversified agro-ecological practices that focus on long term fertility of the soil, and maintaining the biodiversity necessary for a healthy ecosystem (Frison, 2016; Kremen, Iles, & Bacon, 2012). These practices have gradually eroded in the face of intense economical pressure and short-sighted policies to increase crop production (Glaeser, 2013; Singh, 2000). The claim that higher crop production is possible only through technology has also been critiqued by ecologists (Deb, 2004; Bhattacharya & Ninan, 2011;

Sekhon, Singh, & Ram, 2007) who have shown that organic farming practices produce more yield for equivalent area of monocrops (known as Land Equivalent Ratio (LER)[1]) while maintaining the health of the local ecosystem, both underground and on the surface.

Given this deteriorating ecological situation, many efforts to reclaim a positive relationship with the immediate environment have begun by reverting to the traditional practices of farming. Attesting to the embodied values of farming, Norman Wirzba (2003) argues that,

"Attention and responsible action can occur most readily as we directly/practically see and feel our connections with each other and the land... If we can see how our living practices directly affect air and water quality, soil retention and health, species contentment and diversity, communal cohesion, and other markers of environmental health, and then learn to appreciate how nature's services enrich our personal and social lives, we will be much more inclined to change our practices in ways that benefit rather than bring harm to others. The assumption is that we are less likely to misuse or abuse the memberships we see benefiting us directly." (p.8)

As an activity, farming naturally provides a space to raise questions, and develop an integrated understanding about weather, food, nutrition, the economics of food production, water, and local geography. Steven Harper (Roszak, Gomes, & Kanner, 1995) explains that farming allows for "physical embodiment of symbiosis and co-evolution" as seen in nature. The connection between environmental actions and the act of farming is succinctly captured by Wendell Berry's statement "Eating is an agricultural act" (Berry 1992). Linking the act of consuming food to the conditions under which food is grown and brought to our plates

[1] LER is the ratio of the area under sole cropping to the area under intercropping needed to give equal amounts of yield at the same management level. It is the sum of the fractions of the intercropped yields divided by the sole-crop yields

requires a systemic way of thinking about human-nature relationship.

A food garden, by virtue of its elements and their relationships, embeds many action possibilities, to understand principles (such as interdependence) and ideas (such as recycling) related to the environment. When done as a community, farming and harvesting food from the garden allows for many related discussions and motivations to come to fore, as would the regular tending and care of the living space.

3.2 The challenge and promise of urban spaces

Half of the world's population lives in cities, and an upward trend in population growth is predicted in these urban areas with over 7 out of 10 people expected to be residing in cities by 2050 (UN 2002, UNICEF, 2012). The unprecedented rate of urbanization in the past century is a significant contributor to the rapid degradation of the environment. The expanding urban environment has been linked to global warming, climate change, air pollution, over exploitation of water resources and decrease in forest cover, among other problems (Alberti, 2008; Cohen, 2006; Martínez-Zarzoso & Maruotti, 2011; McMichael, 2000; Rees, 1992; Wilby & Perry, 2006; Zhao et al., 2006). Yet, given the trend of urbanisation, it is clear that the design of cities, and how we live in them will play a key role in facing the challenges of sustainability. Recognising, and nurturing, rich urban ecosystems amidst cities presents numerous challenges, as well as opportunities. Many researchers now argue for developing skills of adaptation and resilience, given that climate change mitigation is no longer a practical aim (Bosello & Chen, 2009; Schmidt, 2009). Thus, the nature of cities, and the nature *in* cities will matter (Nagendra, 2016). Yet, as Mclaren (2009) remarks, EE has had a peculiar blind-spot in acknowledging and developing programmes within urban

contexts. While there are a few notable exceptions (such as programmes carried out Bhartiya Vidyapeeth University's Institute of Environment Education and Research (BVIEER), and Centre for Environmental Education (CEE))[2] The bulk of interventions focus on connecting people with natural places, which are somehow assumed to be 'untouched' by human intervention. While appreciation and preservation of such places are important, overt emphasis on such interventions reinforce the separation between human activities and natural systems, and devalue the urban environments in which most students live.

Grassroots community initiatives such as farming can play a role in subverting common notions of cities as being ecologically barren, and far removed from 'Nature' (which is thought as only existing in pristine places). Kudryavstev (2013) describes five trends in urban environmental education, illustrating the diversity of its goals, and possibilities: (1) City as Classroom, (2) Problem Solving, (3) Environmental Stewardship, (4) Youth and Community Development, and (5) City as Social-Ecological System. The last three trends focus on practices undertaken in cities. These initiatives help reaffirm various kinds of ecological relationships, which are otherwise opaque, made invisible by industrial modes of production and consumption. Turning such initiatives into a larger social and ecological revival requires creating what practitioners call 'thick networks' (Monbiot, 2018). These are projects that can grow into larger ideas and practices, which were not originally envisaged. Such a gradual expansion creates further avenues for participation by a wider group of people (rather than a small, invested group). Understanding the 'how' and 'what' of such hands-on engagement in and through community practices can help urban environmental educators

[2] These institutions have worked in both formal and non-formal avenues to create awareness, and promote action using water conservation, plantation drives, waste management etc. However, as Almeida and Cutter-Mackenzie (2011) point out, very little research has been conducted to analyse the effectiveness of these programs, or to understand the perspectives of those working in the field.

design better collaborative learning and action initiatives.

3.3 Urban farming as a site of practice

From the discussion in the above sections, it is clear that food security and production are intimately connected with urbanisation, and related ecological issues, but these connections are not readily visible. Frazier (2018) comments, “Food is a productive site for exploring the intimate intersection of bodies and cities. This is in part due to the inextricable relationship between food, the body, and place. As scholars have long identified, food is a symbolic and material force that transcends and delimits particular places and communities” (p.12). These connections may not be understood in cities, but is still experienced through food consumption patterns. Urban spaces are far removed from the production of food, which is routinely transported thousands of kilometers through various intermediaries, a process that increases the cost as well as the ecological footprint of the commodity. This has a ripple effect on the environment, as growing urbanization has led to the growth of agribusiness, which, driven by corporate profit, has developed industrial scale practices that have led to the loss of traditional farming knowledge and support networks. To compete with, or work with, the practices of agribusiness, rural farmers have been forced to resort to synthetic pesticides, genetically modified seeds, and large mono-cultures. The degraded land now requires a constant input of energy-intensive resources, thus pushing farmers into debt. This leads to the small farmers being driven away from their farmlands, towards urban spaces in search of livelihoods. Repercussions of this shift include cities that are ever-expanding, destroying agricultural land and disconnecting urban space from cultivation.

Given this trend, a focus of my research is to understand how practices in urban

spaces could seek to recapture farmers' traditional knowledge, even as urban spaces perpetuate the nature/culture divide by distancing themselves from the conditions and modes of agricultural production. ‘Urban farming’ has been defined in various ways for different activities within a city space. Broadly, it is understood as the growing and processing of food related crops, and rearing of livestock, within or in the vicinity of urban areas (Mougeot, 2006, p. 4). Typically, resources are sourced from urban areas and products are distributed back into the same space. The process of cultivation can occur in balconies to rooftops, community gardens, near railways and so on. Urban farming is gaining visibility in many cities around the world, as means of sustenance, rebellion, recreation, or for environmental reasons (Biel, 2014, 2016; Holt-Gimenez & Patel, 2009; McClintock, 2010).

Nurturing pro-environmental values amongst urban communities, which face a physical and psychological disconnect from various aspects of nature (Rees 1992, 2002; Dillon et al. 2005) is a challenging task. Yet, as Pollan notes, “Eating and drinking especially implicate us in the natural world in ways that the industrial economy, with its long and illegible supply chain, would have us forget” (Pollan 2013, 408). India is also seeing a small, but noticeable trend of people quitting their jobs in the corporate sector to pursue farming as a vocation. This is for a number of reasons, with food safety and ecological integrity being a prime focus (Bose, 2016; Padmanabhan, 2011; Vijaykumar, 2016). This trend is accompanied by a revival of, and search for, ecologically-sound methods of farming that were embedded in traditional practices. Consequently, the potential of local urban food systems in promoting socio-cultural and ecological sustainability is a growing field of research (Krasny & Tidball 2009; Thorp & Townsend 2001; Turner, Henryks & Pearson, 2011).

Furthermore, the physical activity of farming has a positive impact on the health of people involved, as they become aware of better diet in terms of fresh and local food. Several studies show that exposure to the natural environment helps in reducing stress (Ulrich, 1983; Wells & Evans, 2003). The experience of growing food also allows participants to understand various cycles in nature and be more attentive to their needs, while respecting the interdependence in nature. Urban farms can also serve as hot-spots of biodiversity, and contribute to better air quality as well as micro-climate (Galluzzi, Eyzaguirre, & Negri, 2010; Wilby & Perry, 2006). The benefits of urban farming, from the nutrition and food security perspectives, have also been well studied. However, it is also important to note that the concept of urban farming in India is not new, as immigrants from rural areas have engaged in various forms of farming for local consumption or market produce. As Cook et al. (2015) comment,

"Less traditional, but not necessarily less prevalent forms of urban agriculture include open-space production of high-value products on undeveloped land that is public or private land located along roads, railway lines, streams, and river valleys, and in industrial areas and around airports (Drechsel & Dongus 2010; Simatele, Binns, & Simatele, 2012). Rather than speaking of 'urban agriculture' in general, more research is necessary to understand the particularities of each of these forms in specific contexts" (p. 267)

Community based urban farming requires constant dialogue between participants to partake the knowledge and skills involved in various tasks. The dialogue and sharing of tasks in turn strengthens feelings of community belonging, as people exchange ideas and thoughts on a variety of related topics (Okvat & Zautra, 2011). Barthel, Folke and Colding (2010) conducted a four year long study of allotment gardens in Stockholm to analyze the

transmission of ecological practices amongst communities. They argue that community gardens act as sites of 'socio-ecological resilience', by helping sustain knowledge and skills needed to grow food in the area. The participatory culture in these initiatives, especially from the view of expanding notions of sustainability, is a less understood phenomenon (Poulsen, Neff, & Winch, 2017).

3.4 Research trajectory

The first phase of my research was aimed at developing an in-depth understanding of grassroots environmental practices, especially in terms of their ability to generate motivation. The core question guiding my work was, *how do individuals become motivated to participate in environmental activities?* Given the various affordances of farming discussed in the previous sections, I chose farming as a suitable candidate domain to understand how PEA could be motivated.

There is not much research exploring how people become a part of, and continue participating in, activities at community farms, especially in India. I therefore sought to gather some insights into this process, by studying volunteers' practices in an urban farm, particularly to understand cases where participants did not have a broader 'green agenda' to begin with. I also sought to understand the role of specific engagements on the farm, and how they shaped the perspectives of the community, as well as individual volunteers.

The second phase of my research aimed to apply findings from the volunteer farm, to design school-level interventions that motivate students to take up environment-oriented actions. This application approach was inspired by Nersessian, Kurz-Milcke, Newstetter, &

Davies (2003) who studied scientific practices in interdisciplinary laboratories (artefacts-practice interactions) to develop interdisciplinary classroom practices.

The overall operationalisation of my research questions can be divided into the following steps:

1. Study a farming community where practice scaffolded action and motivation
2. Use findings from this study to design a practice-based intervention in a school setting
3. Study whether and how the design intervention led to action and motivation.
4. Use findings to extend theoretical discussions.
5. Use findings to develop policy recommendation

The next chapter delves into my research methodology, and its justifications.

Chapter 4 Research Methodology

Case studies based on participation and observation, followed by a design-based intervention

"When we encounter a complex issue and try to understand it, what we look for is not consistent and reliable facts but a consistent and comprehensible story. When we ask ourselves whether something 'makes sense', the 'sense' we seek is not rationality, as scientists and philosophers perceive it, but narrative fidelity." – (Monbiot, 2017)

In this chapter

I present the method of participant-observation based case-study as an appropriate approach to investigate the way motivations changed in volunteers participating in an urban farming community. On the basis of this study, a school-based intervention was designed and studied as well. The empirical data collection consisted of interviews, observations, field-notes, videos, and WhatsApp® conversation logs. Data from different sources were qualitatively analysed using methods of thematic analysis. The analysis structure was partly inspired by activity theory, particularly the highlighting of interactive dimensions of the urban farming practices and the use of artifacts. The analytical framework is influenced by situated and embodied cognition perspectives, as they relate to communities of practice (Lave & Wenger, 1991; Wenger, 1999).

4.1 Review of research methods used to understand environmental practices

Initial research in EE was primarily quantitative in nature, with the main focus on capturing explicit knowledge (Marcinkowski, 1993). However, recognizing the importance of feelings, identity, and motivation in generating and maintaining PEAs, researchers now use more qualitative methods, particularly to understand the processes underlying PEA. An extensive review of EE research (Hart & Nolan, 1999) notes the use of several qualitative approaches, such as action research, case-studies and descriptive reports, to highlight the curriculum, context or community action. The authors highlight the methodological complexity of analysing environmental practices, and the need for more participatory and field-based approaches, "First, at the core of much environmental education research is the epistemological stance that constructive environmental actions are underlain by appropriate knowledge and ecologically sensitive attitudes. That this is a complex relationship tied to deeply personal beliefs and values within differing social contexts is argument for a more complete examination of what Palmer (1993) refer to as emergent environmentalism." (p. 38)

Payne (1999) also argues for a research agenda that takes into account embodied experiences, as they get constructed in active interaction with social, historical and ecological environments. Based on these perspectives, a variety of methodological approaches have emerged, such as narratives of Significant Life Experiences (SLEs) (Chawla, 1999), ethnographic accounts (Jagger, Sperling, & Inwood, 2016), critical and feminist discussions (Mellor, 2000) and phenomenological accounts (Iared, de Oliveira, & Payne, 2016; Payne,

1999; Payne, 2016). All these approaches have contributed to the development of a literature around local, embodied descriptions of PEAs.

4.1.2 Research questions

As described in the the previous chapter, the following broad research questions guide my work:

1. What are the key elements of practice that lead to pro-environmental motivations?

2. What role do different practices play in constructing environmental perspectives?

3. How could the community practice of farming contribute to students' understanding, emotions and motivation with regards to the practice?

4. How could urban farming contribute to attitudes and actions reflecting 'relational thinking'?

5. Are there observable changes in student behaviour and dispositions away from the site of the intervention?

I investigated the first two questions in the context of an urban farming community. The next three questions were studied in the context of a terrace farm that I set up in a suburban school in Mumbai.

A number of considerations guided my choice of working with an adult community farm first, in order to design a workable intervention for the school project. At the operational level, I wanted to explore existing practices within the city, so that findings could be easily implemented in urban schools, in a context-specific manner (i.e. for particular types of city

buildings and limited ground space). Rural educational institutions (such as Rishi Valley, Centre for Learning) that practise farming have access to large tracts of space. They thus have different methods, and lesser constraints in growing plants. Also, studying these spaces would not have provided much insight into factors that *generate* motivation, as these interventions work with a captive audience (students). Any characterisation of practice in such spaces would thus only pick up on pedagogical premises of the activity. The adult study was of *volunteers*, and was thus a good way to understand motivations. Also, the space of the urban farm was comparable with the buildings of the schools who had shown interest in the project.

A detailed review of the available literature indicated that these questions have not been explored in sufficient detail, especially through the lens of individual motivation and its relation to community-practice. To understand this relation, behavior needed to be observed and documented in natural settings. This suggested qualitative methods (Huberman & Miles, 2002) as the most suitable methodology for the proposed studies. Moreover, 'what', 'how' or 'why' questions are more amenable to a qualitative mode of inquiry (Eisenhardt & Graebner, 2007; Yin, 2003). My primary focus was to understand whether/how participant motivations change, and what kind of actions emerge from the practice. This required characterising the dynamics of community-based interactions and the nature of PEAs using 'thick' descriptions (Ponterotto, 2006) of the context, which required the researcher to be part of the practice, as a participant-observer.

My participation in the research context (urban farm) as a volunteer allowed for a more nuanced understanding of the artifacts involved, and the nature of interaction between volunteers. It also helped gain trust with the community, such that volunteers were able to

share their experiences freely. Clark, Holland, Katz and Peace (2009) describe participatory research as focusing on "knowledge for action, to be achieved through partnerships between traditionally-trained researchers and lay people in a community". Participatory-research also allows for greater reflexivity and sensitivity on the part of the researcher (Jorgensen, 2015). An overview of the research process is shown below (Fig 4.1).

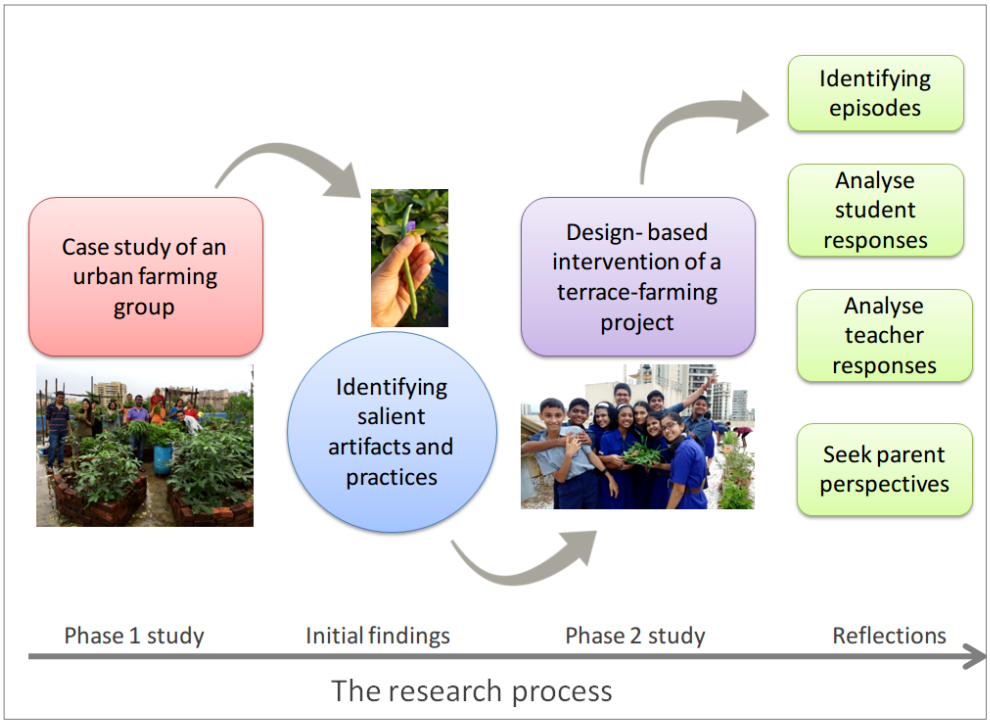

Figure 4.1: Overview of the research trajectory

4.2 Selection of research method for study (phase 1)

Given the exploratory nature of the study, I chose to use the case-study method. The case study is a research approach which focuses on understanding events within their natural setting. In the case study, contextual conditions are paid close attention, and they are

considered as highly relevant to the phenomenon under investigation. Yin (2003) explains that case-studies are especially suited to situations where the researcher has little control of the events, and the focus is on a a dynamic phenomenon within a real-life context (p.2).

This approach allows for close collaboration between the researcher and the participants, through which participant narratives can be documented easily (Crabtree & Miller, 1999), and the rationale behind their actions can be better understood (Lather, 1992; Robottom & Hart, 1993).

A common critique against case studies are that they are not generalizable. However, Yin (2003) argues that:

"case studies, like experiments, are generalizable to theoretical propositions and not to populations or universes. … in doing a case study, your goal will be to expand and generalize theories (analytical generalization) and not to enumerate frequencies (statistical generalization)" (p. 15).

This research began as an exploratory study, with the possible aim of describing or characterizing whether and how pro-environmental motivations and actions emerged from volunteers' practices at the urban community-farm. At this stage, there were no additional explicit propositions made about the nature of motivation and evolution of PEA.

4.2.1 Description of study-site (phase 1)

Mumbai (18°58′N, 72°49′E) is the capital of Maharashtra state in India. The city was developed on seven islands in the Arabian Sea, to form one large island, in the 18th century. The city thus has a number of creeks, bays, rivers and lakes, most of which are under severe stress due to dumping of industrial effluents. Mumbai Metropolitan Region is one of the most

densely populated areas in the world, with the population density estimated to be about 20,482 persons per square kilometre, a figure that continues to grow. Land is thus a premium commodity in the city. Waste management and overflowing landfills are serious issues for urban residents (Baud & Nainan, 2008; Saldanha & Lukose, 2014).

Urban Greens (UG) (pseudonyms have been used unless specified otherwise) is a city farming volunteer group co-founded by Pushpa, a catering officer with the Mumbai Port Trust (MPT). She has been with MPT since 1992, and her interest in farming began from her concern about the bio-degradeable waste generated by their canteen every day. Pushpa was attracted to the idea of turning this waste into a resource through composting, and started growing vegetables on the terrace of MPT. As the initiative got publicity, the number of urban farming enthusiasts grew, and Pushpa decided to start a volunteer driven movement to start terrace farms at different sites in the city. UG works as a program with an NGO. The founders articulated their mission statement as:

- Support people to create urban farms and community gardens.
- Experiment and learn different ways of growing.
- Integrate people's food habits at home with what is grown, and facilitate people's return to living with the cycles of nature.

UG has a strong stance against genetically modified (GM) crops, stemming from the perspectives of the founders who firmly believe in food sovereignty.

At the time of the study, UG terrace farms were being maintained at two locations in Mumbai, in Matunga and Andheri, respectively. Both were situated on the terraces of academic buildings. The group maintains a website to post information on workshops held by

regular volunteers, as well as a Facebook page. The group is featured regularly in local newspapers, and this has worked as an important medium in attracting potential volunteers to the farm. Volunteers are deemed to be regular if they work for at least one Sunday a month. Regular volunteers become part of a WhatsApp® group, where people post about work done on the community farm, as well as individual thoughts regarding farm related topics.

4.2.2 Forms of data collected

Five case studies of individual volunteers were developed, based on observations of regular members' activity on the farm, and detailed interviews. Themes were derived from detailed analysis of individual participants' progress over the data collection period. This is why we term them cases. Yin (2003) describes such cases as embedded case design, wherein subunits become the focus of analysis. He comments: “For instance, even though a case study might be about a single organization, such as a hospital, the analysis might include outcomes about the clinical services and staff employed by the hospital” (p.70). The farm acts as a cohesive site of the study, and the claims of the study are based on interactions that individuals have with other volunteers and artefacts on the farm.

Data includes roughly 60 hours of field notes based on farm observation and participation. The notes for each session were created through discussion with a co-participant observer. The participants, a subset of the community of urban farmers, were part of a WhatsApp® group that facilitates discussions about the farm. This group is actively maintained, and every regular volunteer is added to this group. The researcher was also added to this group as a regular participant. The researcher did not contribute to the conversations, other than relaying logistics related information. The farming members did

not have any objection to recording and analysis of the WhatsApp® data, and text logs of the chat discussions were made for analysis. This data was highly dynamic and spontaneous in nature and required specific tagging and coding. The text was numbered and highlighted with relevant tags that emerged with reference to various activities on the farm.

Apart from this rich data set, seven hours of interview data was recorded and transcribed. Given the exploratory nature of the study, transcripts were validated using member-check, and minor corrections were made. The transcripts were repeatedly read by the researcher, followed by highlighting of relevant quotes with different tags. These tags were refined to generate the first draft of the codes. With these initial lists of codes, two other colleagues read the transcripts and tagged the text, highlighting sections they found relevant to the codes. A refined list of codes and definitions was generated through discussions

4.3 Selection of research method for intervention (phase 2)

The systematic study of the community farm allowed identifying salient artifacts and practices that were important in seeding PEAs. A design-based research (DBR) approach was seen as best suited to introduce these practices within a formal school set-up, since the researcher had an explicit agenda of motivating students to engage with PEAs. Cobb, diSessa, Lehrer, and Schauble (2003) state,

"Prototypically, design experiments entail both "engineering" particular forms of learning and systematically studying those forms of learning within the context defined by the means of supporting them. This designed context is subject to test and revision, and the successive iterations that result play a role similar to that of systematic variation in experiment". (p. 9)

They also point out that DBR methods usually result in theorisation of learning episodes are based on planned interventions, take place in naturalistic settings, and are iterative in nature. The intervention approach was inspired by Nersessian, Kurz-Milcke, Newstetter and Davies. (2003), where interdisciplinary labs were studied (artifacts-practice interactions) to develop interdisciplinary classroom practices. For instance, artefacts that embedded the practice-action-motivation loop (as explained in the next chapter) were incorporated into the intervention design, with help from expert facilitators. Barab and Squire (2004) point out the application focus of DBR by commenting that,

"As such, design-based research suggests a pragmatic philosophical underpinning, one in which the value of a theory lies in its ability to produce changes in the world. Such a system of inquiry might draw less from traditional positivist science or ethnographic traditions of inquiry, and more from pragmatic lines of inquiry where theories are judged not by their claims to truth, but by their ability to do work in the world" (p. 6)

In the current context, an exploratory case-study of a single iteration of the design intervention was analysed (as done by Ma & Harmon, 2009). The next iteration of the project was informally observed, but data on this iteration could not be systematically collected and analysed owing to time constraints. Recommendations for the second iteration were made based on the analysis and reflections of the case-study of the first iteration.

4.3.1 Description of intervention-site (phase 2)

I facilitated a terrace farming project with class VIII students at a Central Secondary Board Education (CBSE) affiliated school at Mulund, a Mumbai suburb. The site was chosen based on availability. School spaces are difficult to access due to multiple levels of constraints,

ranging from general suspicion towards 'outsiders' who may disrupt the public image a school usually tries to uphold, to issues of time, commitment and minimal expenses that a school has to invest during the course of any intervention. In an earlier unsuccessful attempt, I had located a school in Vashi, Navi Mumbai and had numerous conversations with the teacher in-charge of the school eco-club, who showed some enthusiasm in starting with a terrace farm project with middle-school students. Her interest stemmed from her own experiences of growing vegetables in her native place in Kerala, which has interestingly seen movements towards organic farming and subsequent resistance towards the use of chemical-based agriculture. However, the school management was unwilling to give the required space, and bear the expenses related to farming experts who would facilitate the planned sessions with students. After a few unrewarding attempts to negotiate the specifics, I had to give up on further interactions with the school. The teacher was in fact quite upset regarding the lack of support shown by the school management committee, but nothing could be done without their explicit permission.

This experience helped me realize the presence of various stakeholders in negotiating the working of a school, and how gaining an entry means having to deal effectively with each one of them. Modifying my expectations based on prior experience, I located another school with the help of a colleague. This school is situated in the backyard of a landfill. The visceral experience of being located near a waste dump had prompted the school to participate in many activities related to waste management and recycling of e-waste. I decided to interact with the principal directly before getting into discussions with the teacher. The principal found the project interesting from the view-point of using organic waste to make compost and agreed to provide some space and time to carry out the activity of terrace farming. The

negotiations resulted in 40 students from standard VIII participating in the project for one hour every Saturday. My original request was for 20 students spending two hours every week. However, this could not be worked out, so the next best option had to be chosen. After reaching an understanding with the principal, I proceeded to interact with the teachers in-charge of the nature club in the school. Overall, the process of preparing the school and talking to facilitators from an urban farming group who could guide few of the initial sessions with students took over four months. The sessions began in mid-June 2016 and lasted till March 2017.

The school terrace (about 1500 sq ft) was used for developing the farm. It already had a waterproof coating in the form of mosaic tiles since Mumbai receives a lot of rain. There is good drainage and a water source, so there were no immediate resource issues. However, it would get extremely hot during summer months, so it was decided that green nets would be hung to provide partial shade. In order to cut down on expenses, discarded cardboard boxes were used as planters, but these needed regular maintenance.

4.3.2 Forms of data collected

Sessions on the farm were video-recorded and photographed, and students were encouraged to maintain their personal farm journals. The researcher maintained field notes, along with a co-observer. Students usually worked in groups of 3-4. One student from each group was interviewed (total 14 interviews, spanning 7 hours). The study explored students' evolving motivation towards farming, their relationship with different artifacts on the farm, and instances that provided the impetus for larger perspectives, as well as actions away from the farm site. The project spanned 10 months, covering 26 sessions.

Additionally, the principal and teachers directly or indirectly involved in the project were interviewed to understand their perspective of students and their interactions in the farm. Ten parents were also interviewed to corroborate the experiences shared by students. All the interviews were conducted by me, and subsequent questions were asked in some cases for clarification or elaboration. The interviews were audio recorded, and later transcribed by transcribers.

Consent to record and analyse interviews was sought from all participants. Transcripts of the interviews were shared with the adult participants, in order to verify their responses, and in case they wanted any information to be added or deleted. In the school setting, permission for audio and video recordings were sought from the school management, teachers and parents. Students' consent was also sought separately. Pseudonyms have been used to protect the identity and anonymity of the participants. Findings of the research were also shared with the participants and school teachers.

The ethical criteria followed match with core guidelines issued by Research Ethics Board in the global North (such as British Educational Research Association and American Educational Research Association) (Wassenaar & Mamotte, 2012). Broadly, the following considerations were taken into account:

1. Informed consent and the right to withdraw: Participants were provided enough information to make an informed choice regarding their involvement in interviews. They were informed of their right to withdraw their comments at any given time, without the need for any explanation. Confidentiality and anonymisation procedures were followed to protect the identity of the participants.

2. Critical subjectivity: My role as a researcher and a participant-observer was explained to the participants, in order to maintain transparency regarding my positionality in the given context.

3.Minimising harm and maximising benefit: Details of the project and interviews were shared with the participants in an effort to ensure quality and integrity of the data collected. The findings were also synthesized and shared on popular platforms (without compromising on the anonymity of the participants), to maximise the outreach and benefits of the reflections gathered from the studies.

4.4 Data Analysis

4.4.1 Methodology

Usually, case studies in education research are analysed based on the constructivist paradigm, which emphasizes the social construction of reality (Searle & Willis, 1995). Thus, analysing data from multiple sources and viewpoints is recommended. In this case, the theoretical framing assumed that practices at the farm are situated, as well as distributed, across people, artifacts, and traditional tasks. While my focus was on understanding volunteer motivations, and actions, the approach was inspired from a situated, embodied perspective of cognition. This approach “construes intelligent behavior as arising within particular settings such that its features are dependent on that setting, in contrast with a view of cognition as an abstract realm or self-regulating process. The assertion is that 'problem solving’ is carried out in conjunction with the environment'” (Osbeck et al. 2010, p. 31). My interest was in following

a similar trajectory for motivation processes, understood as arising from salient interactions with the environment.

The focus on practice, communities and the way these change individuals makes my study similar to 'Communities of Practice' (Lave & Wenger 1991, 2002), which seeks to understand how changes in individual cognition occur as a result of participating in communities of practice, particularly as the novice moves from the periphery to the core of the practice. My approach could thus be understood as an extension of such situated learning, with a focus on how motivation develops through the practice of urban farming. One key difference is that situated cognition and learning studies examine cases where community participation and learning a practice are one and the same. In my case, I was interested in how participating in a situated practice leads to individuals becoming motivated to start new practices that support the environment. These practices are not the same as the ones they participated in as part of the community, but they share a common thread with the older community practices. The common thread emerges from motivations acquired through interactions in the older community of practice.

In this approach, body-based interactions are examined to understand their contribution to changes in motivation. This approach is different from analyses that focus on language-based discussions and material, where changes in motivation are considered to emerge from interactions with purely symbolic structures. My specific focus here is the mediating role played by artefacts and practices in the development of environmental perspectives, and related actions. In fact, the analysis distinctly moves away from orthodox situation cognition perspectives in acknowledging an individual's intentions, and prior goals (something explicitly denied in situated cognition analysis) while constructing a situation.

This makes the overall analysis approach similar to Activity theory (Engeström, 1987; Nardi, 1996) which emphasizes the mediating role of artefacts in generating particular trajectories of learning and culture, while identifying the dynamic nature of goal-directed processes.

Wherever possible, interviews were conducted to elicit narratives, and experiences of the respondents. Narratives are coherent personal stories co-constructed by an interviewee and interviewer in order to narrate the study of lived experiences or the study of descriptions of a series of events (Clandinin et al, 2007; Pinnegar & Daynes, 2007).

The transcribed interview data was thematically analysed to identify patterns, structures, and relations in the data. According to Boyatzis (1998), “Thematic analysis is a method for identifying, analysing, and reporting patterns (themes) within data. It minimally organises and describes your data set in (rich) detail. However, it also often goes further than this, and interprets various aspects of the research topic”. This is an interpretative exercise. As Braun and Clarke (2014) point out, “If themes 'reside' anywhere, they reside in our heads from our thinking about our data and creating links as we understand them”. Themes were inductively created from the data rather following a theory-driven coding frame. Rich descriptions of data were connected back to the research questions, to provide an interpretation of specific points of interest such as motivation and expanding sphere of actions. Since many themes were closely associated to certain artifacts/ practices, interpretation involved going beyond the description of an occurrence, and relating it to underlying events (Lawler, 2002; Ospina & Dodge, 2005).

To summarise, the research design was data-driven, rather than theory-driven. The data were collected through primary sources such as interviews, observation, artifacts, photos, videos, and chat logs. The findings were arrived at using the methods of thematic

analysis, inspired from an embodied, activity-centered framework. The understanding generated was qualitative, based on the interpretation of the findings.

4.5 Addressing issues of validity

Validity in qualitative research is described as "the correctness or credibility of a description, conclusion, explanation, interpretation, or other sort of account" (Maxwell, 2012, p.122). In case studies, credibility is sought during the data collection and interpretation stages. Multiple sources of data collection (as done in this case) increase its trustworthiness. Regarding interpretation, the criteria of persuasiveness, correspondence, and pragmatic use are employed, to argue for the validity of the analysis (Riessman, 2008). Persuasive arguments provide coherent justification and explanations through relevant evidence. Accordingly, I have substantiated the claims using interview excerpts, and detailing the context. Correspondence refers to narrative fidelity from the point of view of the respondent. This was achieved through cross-checking the transcripts with the interviewees to make sure that their responses had been correctly recorded. Pragmatic use describes the degree to which the research contributes to future work, and theoretical discussions. I have attempted both through reflecting on the implications of the study, and providing some practical recommendations/ guides to further extend this work.

Chapter 5 Phase 1- Case study of an urban farm

"The community-farm is all about connections and learning from our natural surroundings."

– Pushpa, Founder of UG

In this chapter

As described in the previous chapter, the volunteer farming group was studied (participant observation; case-studies of five volunteers) to understand salient practices and community interactions, and how these interacted with volunteers' motivations. Volunteers joined the group for a multitude of personal reasons, and not necessarily with ecological commitments. However, sustained participation in community activities resulted in an expansion in volunteers' perspectives and related actions. In particular, this change resulted from interactions with built ecological artefacts, such as nutrient-rich soil, which can be described as 'performative substances' that help embed and embody a specific stance towards nature. Working with these substances allows volunteers to understand the embedded perspectives in an enactive and embodied (i.e. non-descriptive) way. Together, such artefacts and practices played an important role in developing volunteers' perspectives towards the environment, and guided their actions in the community.

5.1 Context of research on community-based urban farms

Community gardens are based on the common goal of growing food, though concerted efforts of individuals from varied backgrounds and contexts. Volunteers have a sense of

shared ownership of the garden. Community gardens have existed in urban areas since the 19th century in the West, mainly to counter food scarcity due to increasing immigration from rural to urban areas. Such gardens were mainly associated with poor communities. The World Wars, and associated economic depression, also led to a more vigorous growth of such food cultivation. Programs, known as *victory gardens,* which were abundant during World War II, allowed communities to independently source food in the face of massive shortages (Salvidar-Tanaka & Krasny, 2003). With the rise of economic prosperity and the food industry, community gardens gradually lost popularity, until they saw a resurgence in the 1970s, as part of widespread environmental movements. In a comprehensive review, Draper & Freedman (2010) highlight 11 themes governing community urban farming practices in the U.S: (a) health benefits; (b) food source/food security; (c) economic development; (d) youth education, employment, and skill development; (e) open space use and preservation; (f) crime prevention; (g) leisure and recreation; (h) neighborhood beautification; (i) social interaction/cultivation of relationships; (j) cultural preservation and expression; and (k) community organizing and empowerment. These are explicit or formal aims underlying the operations of particular farms. Less is known about the evolving perspectives of volunteers, and how this dynamic process contributes to shaping the community and the volunteers themselves. In India, this process is scarcely understood, because urban community farms, especially with participation from the middle-classes, are a recent trend. Additionally, in contrast to other countries which have provided financial and institutional support for such endeavours, most urban farms in India are run on a purely voluntary basis. However, government bodies seem to now acknowledge the potential of urban farming, and are

exploring feasible policy recommendations, as is evident from the following excerpt of a report by Institute for Resource Analysis and Policy (IRAP):

> "Urban agriculture has not been very popular in India. The rural areas have traditionally provided food for the country's population. There were also resource constraints in pursuing urban farming in a systematic way. However, with more and more people migrating to urban areas, it is predicted that India will add 404 million people to its urban population by 2050 (UN, 2014). This would take away a large amount of water resources from rural areas to meet urban needs, competing with agricultural demand in the rural areas. It is therefore important that the wastewater generated in urban areas is reused in an environmentally sustainable manner to meet part of the food demand in urban areas, which in turn can also reduce the pressure on scarce water resources. Increasing the contribution of urban agriculture in India would ensure food and nutritional security for the rapidly growing urban population in addition to providing jobs." (Sahasranaman, 2016; p. 6)

Understanding the motivations, scope, and challenges of volunteers at urban community farms within Indian cities can thus help in guiding useful policies to encourage similar practices. This case-study is a step in that direction.

5.2 Description of the farm (site of the case-study)

Urban Greens (UG, pseudonym) is an urban farming group. I conducted my research as a participant-observer at the group's farm located on the terrace of a religious institution (a

guest house for Catholic priests), within a school campus in central Mumbai. A part of the terrace was donated to UG in alignment with the institution's pledge to support sustainable initiatives. I have been volunteering at the farm since June 2015, and collected data for a year (every Sunday, from 2015-2016; details in Chapter 4).

The terrace is approximately 3000 square feet in size. At any given time, around 10-15 raised beds, made of bricks, were used. These were made by simply stacking the bricks, and hence could be dismantled and remade every season, according to various requirements (path of the Sun, type of crop grown, trellis support, slope of the terrace etc). Additionally, about 15 large plastic drums were upcycled from factories for use as planters. The typical number of volunteers ranged from 7-15, of which 5-6 would be 'regular' volunteers, who were associated with the organisation for more than 3 years. Most volunteers tended to become 'regular' over time, unless they faced constraints of time, distance or other issues at home. Apart from the founder, volunteers who had spent considerable time (>3 years) at the farm were considered 'experts'. They would often be encouraged to guide the newer volunteers.

Apart from ~15[1] fruiting and flowering trees, almost 20-25[2] varieties of seasonal, edible plants are grown throughout the year (Harvesting time varies from 2 to 9 months). *Amrut-Mitti*[3], a nutrient-rich soil, is prepared mostly during winter months, given the

1 Drumstick, Pomegranate, Custard Apple, Mulberry, Guava, Sonchafa, Chickoo, Stargooseberry, Starfruit, Papaya, Banana, Lemon, Madhumalti, Bougainvilla, Neem

2 Eggplant (3 varieties), Okra, Pineapple, Amaranthus (2 varieties), Indian Roselle (2 varieties), Lemon Grass, Mint, Cuban Oregano, Italian Basil, Thai Basil, Citronella, Sweet Basil, Spinach, Broccoli, Cabbage, Tomato (2 types), Malabar Spinach, Colocassia, Corn, Cabbage, Flat bean, Cluster bean, Ash gourd, Bitter gourd, Sponge gourd, Bottle Gourd, Radish, Beetroot, Turmeric, Mango-Ginger, Yam, Sweet Potato, Dill, Mustard, Fenugreek, Fennel

3 *Amrut Mitti* was developed by the founder of the community farm, who tinkered (in order to make it suitable for urban areas) with a version of the process first described by veteran farming experts such as Shripad

availability of abundant leaf litter during that period. Usually, 2 raised beds (4*2*3 ft dimensions) of *Amrut Mitti* is prepared using around 100 sacks (each weighing ~ 5 kg) of dried leaves. The main expenditure of the farm includes salary given to the gardener, and procurement of dung/urine. These costs are met through funds raised from workshops. Volunteers also occasionally donate if funds fall short (purely on a voluntary basis). Donating is not a significant consideration in joining or staying.

Announcements about farm timings and activities were posted on the WhatsApp® group and the UG e-mailing list. The usual farm timings were 7:45 am to 10:30 am in winters and 7:30 am to 10:00 am in summers. Some volunteers also came on a mid-week evening to take care of the plants. A gardener was employed to water the plants daily, and also to procure waste bagasse available freely from numerous stalls selling sugarcane juice. He also helped in procuring cow dung and urine from a local cow shed, priced nominally. A dilute mixture of this was used to water the plants to increase microbial count and boost growth. This concoction was also available for sale, only for volunteers. Rest of the work on the farm was done by volunteers.

Volunteers mostly gathered to work on weekends. They came alone, or sometimes with new people interested or curious about the terrace farm. Some experienced volunteers took the responsibility of co-ordinators, and they usually chalked out specific tasks on the farm. Regular tasks involved transplanting saplings, sowing different seeds, mulching of beds and pots with fine baggasse, pruning of plants and harvesting of fruits. Occasional tasks included turning of soil beds, remaking beds, re-potting, segregation of biomass (sorting

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Dabholkar (who founded farming communities called Prayog Pariwar and 'natu-eco' farming techniques) and Deepak Suchde, who are naturalists, and far removed from cow-centered extremist ideologies. The process of making *Amrut Mitti* was driven almost entirely by the experiences and observations of these naturalists.

bigger twigs etc for bottom layer, and finer leaves etc for mulch), and making trellises for plants needing support. Volunteers were usually split into groups so that each task was taken care of. A new volunteer was paired with an older one (this choice was by older volunteers, who would usually just decide amongst themselves based on who was present), so that explanations for each task could be provided. Given the constraints of space in Mumbai, volunteers are able to use the community farm for hands-on learning, in addition to sharing the harvest that is produced at the farm. Interactions with other members also become important avenues for learning, as discussed in the following section. Thus, many volunteers reported enjoying their visits to the farm, even if they had their own garden at home.

Experienced volunteers often called people to stop work and gather around. This happened when some important situation or learning was encountered, such as efflorescence of certain plants, plants like cauliflower and spinach going to seeding, or markers of biodiversity like birds' nest or eggs. It could also be problems like severe compaction of soil, which stunts plant growth, fungal infection, other forms of pest attack and so on. There was an active component of 'show and tell' by the experienced volunteers, as they used the plant and the growth situation to talk about related issues. For example, seeding of plants were carefully monitored so that seeds could be stored and sowed in the next season. Soil compaction lead to discussion around the importance of mulching and its conspicuous absence in landscaped gardens seen across the city. Pest attack sparked diverse conversations about organic insect repellents, establishing a natural pest-prey relationship, erratic weather, or just allowing nature to take its course. Suggestions and comments provided by the experienced volunteers were seen as pointers for hands-on learning on the farm.

One of central activities on the farm was building microbe rich soil termed as *Amrut-Mitti*[4]. It is made by decomposing dry bio-mass, comprising mostly of dry leaves, using an organic accelerator called *Amrut-Jal,* whichis made from a mixture of water, cow[5] urine, cow dung and organic black jaggery. Cow dung contains many microbes that aid in decomposition while the urine has high amounts of urea, which creates an ideal ambiance for the microbes to multiply. Jaggery aids in fermentation. The method harks back to the traditional practice of keeping cattle near the farm, thereby allowing a mutually beneficial relationship between the soil, farm produce, cattle and the farmer to emerge.

Once prepared, *Amrut-Mitti* is a nutritious, microbe-rich soil. It has high carbon content, and good water holding capacity. The soil is also an *artifact,* which embeds a set of practices, arising from ecological perspectives that are endorsed by the founders, in terms of imitating natural cycles and respecting the complexity and abundance of living organisms that constitute the soil (see figure 5.1[6], for the different connections embedded in the process of making *Amrut-Mitti*). The practice of decomposing biomass ensures the carboniferous matter going back into soil, instead of being burnt and released into the atmosphere. Recent studies support the practice of using dried leaves to build soil, by linking efforts of increasing

4 A detailed description of the process can be found under the resource section at the following website link: https://purvita10.wixsite.com/urbanleaves/booklets

5 While the dung and urine obtained from indigenous cows is preferred, the founder narrated that in the end they want the dung of ruminants who are fed a healthy and diverse diet. Thus, a number of times, buffalo dung had also been used. During a workshop on *Amrut Mitti*, she narrated that people in different areas have also tried to adapt the process by using locally available dung (such as horse or goat in hilly areas). In a discussion with Pushpa, she mentioned that an Australian intern (http://www.urbanleaves.org/2010/07/making-of-amrut-mitti-heaps-at-mnp.html) even experimented with kangaroo dung. However, Pushpa felt that the proportion of the ingredients then used had to be tweaked accordingly, as they would have different potencies.

6 The views espoused by the founder and the volunteers are based on their experiences, and collective narratives, and thus may not be in accordance with scientific views on the same. For instance, while Amrut-Mitti has a high carbon content, claims regarding the process as being an effective way of sequestering carbon need to be investigated more critically. This, however, is beyond the scope and intention of the present case-study.

soil carbon to mitigation of climate change[7] (Singh et al. 2010; Wilby & Perry 2006; Sanchez 2000). Making *Amrut-Mitti* addresses the problems of lack of fertility in soil, as well as excess of carbon gases in the air, while growing food in urban spaces. As the founder of UG elaborates,

Our air, our soil and our food are so deeply interconnected. Our learning through our productive organic rooftop food farms, our experience with the nutrient and microbial-rich Amrut Mitti, made by using dry leaves and biomass in our surroundings, has opened our eyes to this wonderful resource of dry leaves, which today, we see being trashed in the city … Our UG community rooftop farms are lush green and great carbon sinks in this mega city today. Over the years, our volunteers have been collecting heaps and tons of dry leaves to make Amrut Mitti. The miracle of increased carbon in our soil, feeding the microbes and in turn our trees, blessing us with rich harvests is a dream realised on our farms.

(Source: From a discussion on 'Save a Leaf'[8]campaign)

7 According to the founder, the texture and lightness actually prompted her to get *Amrut-Mitti* tested, and she found that it had over 18% organic carbon (normal soil contains 0.5 – 3%), thus leading her to read on carbon sequestration (the experience and observation was thus driving formal knowledge acquisition).

8 'Save a Leaf campaign' was an initiative taken up by volunteers to collect dried leaves from nearby residential areas to make Amrut-mitti, and prevent the burning of leaves (a usual practice in winters). They connected this to air-pollution, and proposed the making of leaf compost as a practice that is beneficial for the soil, as well as air quality. As part of this campaign, they encouraged people to bring dried leaves, and used social media to gather support.

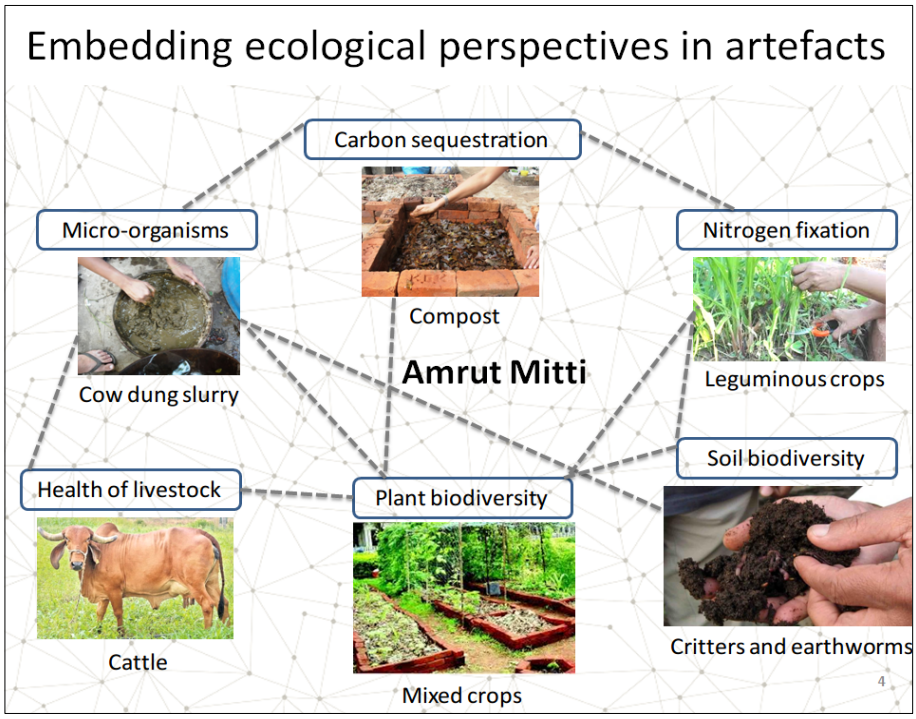

Figure 5.1: The process of making *Amrut-Mitti* embeds diverse environmental considerations and systemic understanding of relationships, and brings them together in an integrated form.

Newcomers worked as apprentices, getting trained in specific steps involved in various tasks, such as using wood ash during transplanting, using rough bagasse as bottom layer of soil beds, interlocking of bricks to make sturdy beds, not adding mulch too close to the roots of the plant (to avoid decay of the stem), careful pruning of the plant, depending on whether it is fruiting or in early stages of growth and so on. Though there were no overt gender biases in allocation of tasks, older women and young children were assigned relatively less exhausting jobs, such as harvesting the fruits and vegetables or sieving of soil for further use. Photos of plants, and people engaged in different tasks were clicked by volunteers for the purpose of documentation. The pictures were put on the WhatsApp®

group as well as uploaded on the Facebook page as a way of gaining appreciation from fellow volunteers, and inviting other people to join the community.

The harvest was a cause of much excitement and happiness, and group pictures of beaming, perspiring volunteers holding fruits and vegetables were almost always the day's highlight. The harvest was shared among the volunteers, no matter how meagre the quantity. Occasionally, a volunteer brought some refreshment in the form of herbal coolants, or a dish made from the harvests. The drinks and harvest usually lead to exchange of new recipes, with emphasis on nutrition and health. After about three hours, volunteers usually called it a day. Apart from the regular jobs on the farm, occasional tasks included improvising the design of raised beds, trellises, sourcing of raw materials etc. For instance, due to concerns of possible seepage, a bed consisting of a raised platform with steel frame and wooden boards was designed by two volunteers. Such tasks employed a diverse range of expertise that volunteers might have.

5.3 Background of volunteers

A brief profile of each volunteer is presented below. Pseudonyms have been used to maintain anonymity of the volunteers.

5.3.1 Payal

Payal is one of the active volunteers at UG. She has an educational background in finance, and took voluntary retirement from her job while in her forties. She has two children, aged 8 and 14 respectively. She initially joined UG in August 2013 because she wanted to do some activity for her child, who was part of an informal school group. Her interactions began by participating in a workshop about kitchen gardening conducted by UG. She mentioned

feeling especially good about that workshop in terms of finding like-minded individuals, and a spontaneous feeling of fraternity.

Soon after joining, she got associated with a project taken up by UG to teach kindergarten children from an international school some basics of farming. She felt that her interest in various activities on the farm surged after that project because of the positive response received from the students. She was initially apprehensive about the outcome, but their enthusiasm and learning led her to take the idea of urban farming more seriously. So, as soon as she was able to shift to an apartment with a balcony receiving decent sunshine, she began growing various plants. Earlier she always felt she had a 'brown thumb' as compared to her relatives who maintained fancy gardens. However, after joining UG, she mentioned feeling much more confident and knowledgeable of techniques involved in growing plants.

Being methodical by nature, she explained that she sees farming as a scientific activity, requiring rigorous analysis of the methods employed. She has been documenting and experimenting with seasonal plants, in terms of conditions needed for their growth and amounts needed to suit family consumption. She mentioned the documentation as helping her choose simpler methods and shared the information with other volunteers. She was also mindful of the weather and apartment infrastructure conditions that affect growth of plants. The difficulty in procuring good quality seeds that would sprout led her to take active interest in seed-sharing, and the practice was encouraged by Pushpa (founder of UG). She co-ordinated the 'Save a Leaf' campaign, which sought to prevent leaves from being burnt or sent to the landfill, and instead be used for composting and mulching.

She explained that work at the farm always had something new to teach her and recalled specific incidents that led volunteers to discover something new (such as learning to

prune plants, learning how to harvest cabbage). She also mentioned that work and discussions on the farm have helped her become much more health conscious, as she has been trying different kinds of herbal coolants and recipes at home.

Over time she talked about UG to many people, who she feels get interested because of the obvious connection with being able to grow healthy food, but most don't turn up at the farm to volunteer on a regular basis. Nevertheless, she mentioned feeling hopeful about terrace farming because of severe space constraints and increasing interest in the idea of fresh harvest. However, she also articulated the need to start with young children because she felt it is difficult to change adults.

At the time of writing this thesis, Payal helped facilitate a community farming project in her locality within a Brihan Mumbai Corporation (BMC) park, along with neighbours in the residential area. A diverse age group of individuals are volunteering at that site.

5.3.2 Arun

Arun is an active participant in his late thirties, and was on a sabbatical during the time of the interview. He probably commuted the most (35 km) among all the volunteers to work on the farm every Sunday. He heard of UG for the first time back in 2012 and attended a workshop by them, but did not become a regular volunteer till 2013. His motivations to become regular stemmed from an enthusiasm for physical activities.

Having a background in computer applications, he subsequently helped set up the UG website and pitched in organising other workshops. He mentioned enjoying the experience and exposure of managing events. At home, he made *Amrut-Mitti* successfully, and described

feeling happy with the growth of plants in that soil. He has been growing a few plants in his balcony, though space is a constraint.

He felt his time at UG has led him to recognise the value of patience needed while growing plants, and that one has to understand that things take time. He also felt that the work has helped him realise the inherent value of many things that are normally discarded. He mentioned having a newfound respect for farmers after realising how tiring it is to work for even 2 hours a day on a small terrace space, despite having help from other volunteers. He also felt very appreciative of being able to meet different people, who according to him had provided him with a lot of information and knowledge about farming practices.

His volunteering efforts have not been fully appreciated by his family, and he mentioned facing some resistance, despite which he has been continuing to work on the farm. He felt it is difficult to change individuals unless they take some interest, and therefore finds the idea of greening every terrace in Mumbai a difficult task unless local people are involved.

He strongly felt that children should be exposed to farming, especially from the view of respect for physical labour, which is commonly considered inferior to intellectual activities in Indian societies. He also sees it as a valuable way to establish a connection with food and nature. At the time of writing this thesis, he was exploring options to work with another volunteer turned farmer, full-time.

5.3.3 Aarti

Aarti is one of the active volunteers at UG. She is in her mid-forties and lives with her family (husband, two grown-up children and her aged mother-in-law). She first came to know about UG through an article in a newspaper, and wanted to attend a workshop by them. At that point, the registration for the workshop was over, so a volunteer asked her to try and visit the

terrace farm on Sundays instead. At that time, her interest was centred more around the aesthetic appeal of flowering plants. However, she mentioned feeling more serious about the tasks at the farm after she was encouraged to become one of the co-ordinators.

She began growing a few herbs and plants at home, and would like to grow more if space permitted. She felt that the experience helped her appreciate the effort that goes into growing food, and also understand the difference in taste when eating fresh harvest. Gradually, she stopped buying junk food and processed foods and mentioned enjoying eating raw vegetables a lot more. She also tried to bring some change in the diet of her family, and felt that they have been supportive. Her interest in food also led her to explore various uses of plants being grown at the farm, and she began making dried spices, and mouth-freshener mixes using edible leaves of different plants.

She mentioned that working at the farm also helped her appreciate phenomena that she may have otherwise felt repulsed by. For instance, she said that she felt a lot of apprehension in handling cow-dung initially, and would scream at the sight of any insect crawling close to her. However, after seeing the way plants were growing in *Amrut-Mitti* soil, she gradually began shedding all inhibitions. In fact, she was proud to be known as the kitchen-composting specialist at UG, as she had taken a lead in conducting kitchen-composting workshops. In her words, she had made peace with all the insects in the soil, knowing that they were beneficial, and was comfortable scooping bits of cow-dung, *"all for the soil".*

5.3.4 Nitish

In his early forties now, Nitish described his induction into the farm as a reverse journey, from exposure to healthy food to getting to know the source of it. He recalled having to seriously change his diet in 2012 due to ill-health, after which he began actively looking for groups to know more about growing edible plants. He has a small space around his house where his parents used to grow many ornamental plants, and he was intrigued with the idea of being able to grow something for consumption as well.

After joining UG, he felt confident of growing vegetables, and now has a variety of plants at home. He feels that as a volunteer at UG, he has been able to contribute to society in some way, and mentioned it being a tradition in the family to spend some time doing work for others. He often takes responsibility for getting drums required for planting trees at the farm, along with other technical support. He owns a small manufacturing unit, and often likes to experiment with different materials to build various kinds of planters. He played an active role in collecting dried leaves from various parts of the city during the 'Save a Leaf' campaign, and has been part of the organising committee for other workshops as well. He finds the practical knowledge imparted at the farm quite essential for trying similar methods back home.

Over time, he has talked to many people about UG, and has received positive responses though they haven't been able to visit the farm. Once, he tried planting a few tomato saplings around his residential area, with hopes of getting people interested when they see ripe tomatoes on the roadside. He feels the act of growing plants boils down to individual desire and has the potential to spread further.

He sees urban farming as a worthwhile economic activity as well, and feels children might choose to pursue such activities seriously if given proper exposure at school. Along the same lines, he remarked that organic farming should be subsidised to allow competition with food grown using chemical inputs.

5.3.5 Heena

Heena is a gregarious, active woman in her late forties. She is known for her enthusiasm in connecting to new volunteers at the farm. She explained that her time is mostly divided between family, farm activities and pursuits of interest in marathons and classical dance. She got acquainted with UG through a friend at a running group, and mentioned the idea as instantly attractive because it brought back memories of gardening as part of school activities. Once she visited the farming site, she mentioned feeling naturally attracted to participate in the activities. She joined the group when it was still in its infancy, so there weren't too many people to help at the farm. She eventually played a major role in setting up most of the beds at the farm, and also took lead in introducing more people as volunteers. She relies on her intuition when it comes to handling plants, and encourages others to try out different approaches on the farm. She mentioned feeling satisfied in seeing others take up responsibility at the farm. She enjoys arranging pot-lucks on the farm, and celebrating various occasions with other volunteers. She now feels that the ‘community’ aspect of the farm carries a lot of importance for her, as she has made close friends working together at the farm.

She described her exposure to growing food as being instrumental in actively looking for organic food products, and attempts to grow some vegetables at home too. She mentioned

that her mother-in-law wasn't appreciative in the beginning, and considered it a hassle. However, over time her stance had softened, especially after seeing fresh harvest being cooked at home. Encouraged by the small success, she also began to utilise space on the apartment terrace to make *Amrut-mitti*, and grow larger plants. She often shares the harvest with neighbours as a token of appreciation for letting her use the common space, and help them get interested in some of the activities.

She felt growing plants is ultimately an act of love, as she found herself unwilling to uproot plants even if they were diseased, having seen them grow from a seed. She also described gaining patience after her experience at UG, as she learnt to appreciate the time it took for plants to mature. In her words, it is about "*respecting natural rhythms*". She has spoken to many people about farming practices and feels that most feel tempted after seeing fresh harvest, but are reluctant when it comes to actual work. With this observation, she is more hopeful of introducing younger children to farming, so that they form some connection with nature.

5.4 Emerging motivation themes

Different themes and categories emerged from the analysis of volunteers' activities at the farm. A schematic diagram of the themes (figure 5.2) is shown below:

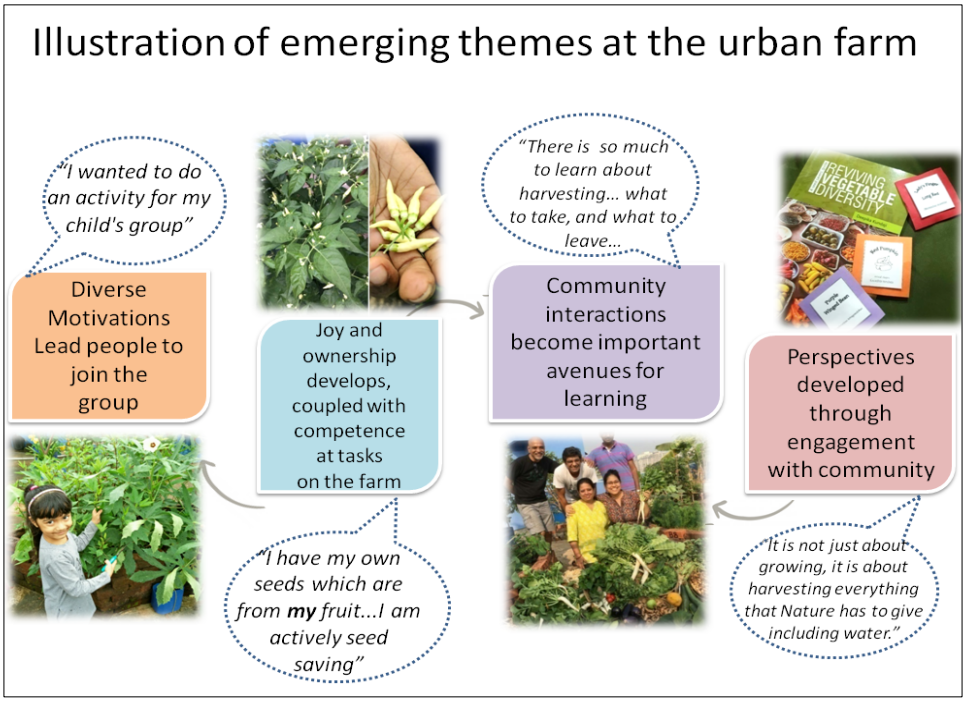

Figure 5.2: Themes identified in the context of volunteer interviews and farm observations

5.4.1 Diverse motivations lead individuals to become volunteers

Volunteers cited varied motives for joining the group. Surprisingly, the reasons cited were not motivated from an altruistic perspective of 'saving the environment'. They were mostly personal, such as interest in outdoor activities, aesthetic appeal of flowers, wanting to design activities for children, interest in nutrition offered by fresh harvest, childhood experience of growing vegetables in the backyard and so on. None of the volunteers joined with explicit motivations such as greening the terraces in Mumbai, or with ideas of seed sovereignty to challenge the GM lobby. However, these are clear perspectives with which the founders came together to start the urban farming group. This implies that the alignment of perspectives (among different volunteers, as well as with those of the founders') is not a given just because volunteers chose to join the group. However, volunteers begin negotiating larger ideas through apprenticeship and learning from the founders of the group, who have

created practices in the farm that embody their perspectives. The activities in the farm also lead to an expansion of motives, that begin from personal interests and slowly encompass wider goals, which become salient through involvement and interactions at the farm.

This evolution of interests suggests that environmental motivations need not stem from altruistic notions (Schwartz, 1970; Schwartz and Howard, 1981). Instead, larger ecological issues can be assimilated within personal self-interest (De Groot and Steg, 2009). For instance, interest in a good harvest expanded to care for the plants, which in turn depended on the fertility of soil, quality of water and so on. The following conversation illustrates the interest of a volunteer in using natural alternatives to cleaning materials in order to avoid polluting water. This idea was catalysed through *Kapur Tulsi* (Camphor Basil) cuttings, that were brought by one participant and grown on the farm. The camphor-like aroma of the leaves led Payal to use them to clean her floor. She later shared her experience with other volunteers at the farm:

Payal: Hey, I am harvesting some Kapur Tulsi, does anyone else need it?

Another volunteer: What are you using it for?

Payal: I am using it for cleaning the floor. I have been trying to cut down on chemical cleaners. Now I use a cleaner only once a week.

Another volunteer: Really! Does it help?

Payal: I think it works fine and we have to try avoiding such chemicals like we do on the farm ...

Another volunteer: I'll also try, please harvest some for me too. (Source: farm log notes)

Volunteers have also tried different herbal concoctions, such as citronella, lime leaves and lemon grass, all growing on the farm, as alternatives for cleaning chemicals, some of them

are actively trying to reduce dependence on commercially available ready-to-use products. These herbs are also used for flavoring tea, water etc., replacing artificial flavors. One can thus observe farm artifacts and interactions as contributing to an evolving sense of personal well-being.

5.4.2 Joy and ownership develops with competence in tasks

Most volunteers tried making Amrut-Mitti at home, and the success gave them the confidence to start growing a few plants. As volunteer Arun commented,

> *I also made Amrut- Mitti at home in tubs after the workshop. It was a great experience. Plants did thrive in that soil.* (Source: interview 15032016_02)

The subsequent gain in knowledge and skills are associated with pride in the accomplishment of task at hand, as is evident in Payal's remarks about her harvest and seed-saving activities,

> *I have my own seeds which are from **my** (emphasis original) fruit. Now again this year there will be Ambadi seeds. I am actively seed-saving.*[9] (Source: interview 10052016_01)

There is a gradual increase in the repertoire of activities that volunteers feel motivated about, and this develops through tangible positive feedback, in terms of harvest or encouragement from peers. For example, Aarti felt her involvement with UG growing through the combined experience of observing the farm, and being assigned certain tasks as a potential co-ordinator to guide new participants.

9 In a recent conversation, Payal explained that her interest in seed-saving has increased after an episode of seed-sharing. She got some Chilli seeds from an acquaintance from Kerala, and grew them. About Six months later, she came to know that the person had lost all her seeds in the Kerala flood, and was able to give her back some of Chilli seeds. According to her, *"That is the beauty of seed saving and wide distribution."*

> *This year I am doing a lot of trial and error. Frankly speaking, after they have put me in the core committee, I have started feeling responsible ...* (Source: interview 24042016_03)

She expressed feeling happy as a result of being able to invest more time at the farm,

> *See, I never knew how things grew... I mean I was amazed to see drumsticks growing, I was amazed to see the papayas hanging.. I was very happy to see the bananas.. I have never seen all these things because our upbringing has been in the city. Our only touch with the nature has been the trees on the roads, something like that...never been to any farm or anything... So the pleasure of seeing how Bhindi flower looks, how the leaves look..it is amazing for me, how a brinjal leaf looks, how it grows... I never knew all this...except for a few flowers that I can identify.... so, it is just amazing, everything is amazing!* (Source: interview 24042016_03)

More generally, the expectations from the community guide one's perception of self-efficacy, and affect intrinsic task-motivation (Bandura & Schunk, 1981; Thomas & Velthouse, 1990), in a positive manner in this case.

Working with the plants also seemed to evoke a care-based relationship with them, as the volunteers would describe visceral reactions to plants affected by disease or pests. Their receptiveness is enhanced through close nurturing of the farm. Heena, for instance simply puts it as 'love',

> *I feel if the love for the plant is not there, it will not grow well. You have that excitement and feeling. Even with so much work and love, I face all kinds of problems. There are pest attacks. The tomato plants you saw right, one of them has*

curled leaves and is not giving me any fruit. It was the first one I planted and maybe it was too cold then, I don't know. But still I have not uprooted it and thrown it away. I mean I have seen it grow, I can't just throw it. I will still wait and be patient. This requires a lot of patience. Last year also my tomato plant flowered and flowered but no fruit came. In the end it started fruiting and gave me lots of fruit. All this patience... (Source: interview 07042016_04)

5.4.3 Community interaction as important avenues of learning and motivation

Volunteers engage in diverse tasks on the farm, guided by more experienced urban farmers, and this apprenticeship leads to gaining of specific knowledge and skills. The learning is situated within the context of farming (Lave & Wenger, 2002), through actual handling of artifacts in the farm. Constant feedback from peers also acts as a motivation to learn more. A farm volunteer Nitish, described the following event as pivotal in his learning,

A year back we had there was a critical problem then in the sense that the spinach and mustard seeds were getting eaten up by rats. So we decided to make saplings at home instead. I also had a problem of mice at home. So I thought why not make a ventilated box to cover the plant till it grows a bit. I even posted the picture on the WhatsApp® group. That time Pushpa had warned me that the box is made up of acrylic and the heat which the plastic generates may hamper the growth. But I was very confident that there was enough aeration and the plant would be protected from mice as well. But I was actually proved wrong. It was protected from the mice but the heat from the box did not allow my plant to grow. It was a great learning experience. I have still kept the box in the balcony as a memento.

(Source: interview 14042016_05)

To illustrate another instance, Aarti was initially wary of touching insects, and thus hesitant to handle the soil. However, her stance towards the creatures softened considerably after participating in *Amrut-Mitti* sessions, where she observed the correlation between insects in the soil and its fertility. Later, with some encouragement from Pushpa, she took the initiative of maintaining kitchen compost bins at the farm, and grew to be quite invested in the process, as evident in her conversations with other volunteers.

> *The whole transition from becoming waste to compost is really beautiful. It serves so many purposes ... it doesn't go to the landfill, the plants thrive with the addition of compost, and some seeds germinate from the compost itself. That ash gourd and papaya on the farm came from my kitchen compost! It's wonderful! Otherwise, those seeds would have gone waste at the landfill.* (Source: farm log notes)

5.4.4 Guided attention motivates changes in perspective

Volunteers reported particular tasks on the farm as drawing their attention, and subsequent concern for the phenomena they were otherwise unaware of. The following comment from Payal describes her thoughts on soil, after working with *Amrut-Mitti* on the farm.

> *I didn't think about soil at all. Never thought about soil. It was all about compost ... after doing the Save A Leaf campaign, trying to understand the chemistry and whatever, doing all this, I have a better understanding of soil. And you can make out when you see the difference, like the other day when we were re-potting[10], the bottom soil was red earth, it was hard and soggy, clayey actually, so the roots could not*

10 Re-potting is the process of removing soil from a planter, and adding leaves, bagasse at the bottom. The soil is loosened, and some wood-ash is mixed. This is done to replenish the fertility of the soil, and avoid compaction. The leaves at the bottom slowly decompose and add organic matter to the soil.

> *grow. Soil needs fertility, it needs structure and it needs microbes. So that red earth didn't have structure, it didn't have carbon for aeration and all that. So it didn't have microbes ... This is not something I knew 2 years ago. You are learning the significance everyday.* (Source: interview 10052016_01)

Participating in the making of *Amrut-Mitti* provides volunteers with a visceral sense of ecological relationships. This sense emerges from volunteers performing different actions that are still part of life in many Indian villages, such as getting cow-urine, cow-manure and dry leaves, bagasse and local soil in order to make *Amrut-Mitti*. These actions create a 'coagulative' practice – a set of actions that generate an understanding of the interdependence of elements in the environment, such as the symbiotic relationship of livestock and a farm, and the need for biodiversity for a healthy ecosystem. The term 'coagulative' captures the quality of the practice wherein seemingly different actions are integrated. This coagulation gradually leads to amorphous ideas becoming more substantive and actionable. For instance, the need for cow-manure led to the realization of lack of healthy cows in the city, because many volunteers found strands of plastic in the manure they collected. Such close interactions led volunteers to deeply reflect on their use of plastic, and garbage disposal in their communities. Making *Amrut-Mitti* thus creates various associations between elements that are systematically compartmentalized in an urban set-up, in terms of production, consumption and waste disposal. Growing food thus becomes a part of a larger cycle, encompassing various forms of life, ranging from bacteria to cattle.

Another episode on the farm helped reiterate the idea of interdependence embedded in interactions. Nitish, who had been given the responsibility of monitoring the health of plants, along with a few other volunteers, noticed caterpillars on the farm. These caterpillars

had evidently eaten most of the lilies. His immediate reaction was to consider them as pests, but the ensuing discussion went as follows:

> *Nitish: We need a solution for these caterpillars. Should we remove them manually?*
>
> *Another volunteer: At a butterfly garden in Thane (a location in Mumbai), the owner said he plants a separate section of butterfly feeding and host plants and trees. But then his focus is butterflies. What is our purpose? Understanding biodiversity? Or farm-to-plate?*
>
> *Pushpa: Biodiversity is necessary for having an organic farm-to-plate in a sustainable manner. Sometimes we may feel that a certain pest is taking over the farm completely. However, given time there comes along a predator for it. Pests attract ants, who attract spiders, and insects, who attract birds who manage pests. The food chain needs to get established on a farm. Over time a balance is maintained. So part of what you grow has to be shared with bugs, slugs, snails and birds, as they all play their part in the ecosystem.*
>
> *Nitish: Okay, so let us keep observing them.*
>
> *Payal: Butterfly season starts end of rains. On the farm have seen caterpillars of lime butterfly and lily moths. We are fortunate to see all this unfolding in a concrete city!*
>
> (Source: WhatsApp® log)

Nitish began tracking the population of caterpillars on the farm, and in the process observed other insects, sparking further discussion on the need for biodiversity. Similar to this case, other phenomena have acquired significance, starting with visual attention, which scaffolds aesthetic and emotional bonds, and then leads to further sensitivity towards the environment. This finding aligns with other studies that have explored the role of affective experiences

based on nature-based interactions in the development of pro-environmental perspectives (Ulrich, 1983; White & Stoecklin, 2008).

5.4.5 Influence in perspectives through engagement with community

Different engagements at the farm scaffold many narratives related to the connections between humans and plants. These evolve into general perspectives about the environment. Participatory artefacts such as *Amrut-Mitti* can be seen as 'performative substances', which embed and embody a specific stance towards nature. They are performative substances because working with these substances allow volunteers to understand the embedded views towards nature in an enactive and embodied (i.e. non-descriptive) way, while also recreating in an urban setting farming practices that are rapidly disappearing from India's villages. Volunteers' participation in actually creating *Amrut-Mitti* (as opposed to being given the rich soil) allows them to embody these practices, and this embodied understanding aligns their experience with the perspectives similar to that of the founders. For example, most of the volunteers voiced the idea of 'giving back' to nature whatever is taken from it, a thought embodied in the process of making *Amrut-Mitti*, which needs dried leaves as input. Arun's idea of sustainability shows the influence of farm activities:

Sustainability is all about that, right, you put back what you have taken from the soil.

(Source: interview 15032016_02)

Ideas pertaining to frugality and re-usability are also embedded in the practices, and these were often highlighted while discussing inputs required to make soil beds, and other similar infrastructure. For instance, Payal saw growing food as engaging with the issues of biodiversity and waste management as well,

by growing your own food, you are greening your area, adding to the biodiversity... you should see the bees I have in my balcony or other pollinators. It is just not one thing and you are not adding things to the landfill... (Source: interview 10052016_01)

The emphasis on turning waste into resource manifested in practices such as mulching and composting. This led to active collection of dried leaves, subsequently resulting in a campaign against burning of leaves, which later took shape as a petition for the right to clean air. Similarly, pest-predator relationships were often observed as markers of soil health at the farm, and this practice led to volunteers developing critical views of artificial means of removing pests, as well as an understanding of the importance of biodiversity. These examples illustrate the way wider narratives emerge through practice-based embodied interactions.

It was also interesting to note volunteers' efforts to introduce others to the practices, through innovative and generous interactions, leading to the formation of local community networks. To illustrate, Heena felt that fresh harvest provided a strong incentive for volunteers to get interested in farming activities, and recalled Pushpa making it a point to give new volunteers more harvest to encourage them to work at the farm. In accordance with this belief, she made use of the same gesture to persuade her neighbors to allow her to use the apartment rooftop to grow vegetables.

See, this apartment is shared by six houses and initially people were very doubtful about seepage and so on … Anyway, now they are supportive because I share most of the harvest with them and have given everyone a key to the terrace so that they are

free to check and can even take anything they want without asking me ... that is how people get involved. (Source: interview 07042016_04)

The feeling of 'belonging' to a community was also seen in episodes where volunteers did not seem to be completely knowledgeable regarding topics such Genetically Modified (GM) crops. To illustrate, Mustard was grown on the farm during news of the GM trials of Mustard. Pushpa, the founder, commented on how seed-saving was symbolic of the group's resistance to commercial production of GM crops. Eventually, most volunteers also participated in an online petition to protest against the production of GM mustard. On being asked for reasons for doing so, they seemed to justify their support using different lines of reasoning (not necessarily backed with scientific knowledge). Their engagement with the founders, and experiences at the farm seemed to influence their stance regarding GM trials in various ways.

For instance, Arun gave the following analogy:

what I think is that unless, like you take medicines okay... The dosages of medicines is so small, so if introducing a medicine in the market takes years and years of study of side-effects etc ... then if you are having so many tests for something you are consuming in such a small quantity, then food which is a major part of your daily diet, if there is no such long term study done, then it is not right to introduce these things ... (Source: Interview 15032016_02)

Nitish, provided yet another argument against GM trials:

"*Economic plea would side the GMO, but it will not enhance the health of the country. This is the standoff/tradeoff. The companies into GMO have deep pockets to brainwash majority of people into thinking that consuming that kind of food will*

never be harmful, but having interacted with so many organic activists and working myself on the farm, I know it is otherwise. (Source: interview 14042016_05)

Payal rejected the notion of GM seeds outright, based on the idea of her experience with seed-saving,

Using chemical treated seeds, or adding chemicals at each stage of plant life or GM seeds - that is not the answer. Chemicals are taking a toll on the health of generations. GM seeds come with their own problems. Seeds on their own mutate, but over a period of time, following nature... With GM, you cannot save those seeds for the next season – hybrids produce seeds whose plants don't give fruit. GM seeds are the property of the company. You need to keep buying in both cases. It is a question of our seed sovereignty. I have the right to seeds and their offspring in my home, that gives me future generations of plants. I have a right to safe food. (Source: interview 10052016_01)

Sustained participation and engagement with practices on the farm thus contribute to a significant shift in perspective and related actions. This shift may not be based on scientific accuracy (in terms of truth or falsity of the perspective). Rather, it highlights a change in world view (such as seed sovereignty forming an important part of the farming cycle; GM seeds disrupting it and so on).

5.5 Summary of findings

This case study of the community farm indicates that volunteers gradually developed pro-environmental perspectives through participation in the farm tasks, and extended their actions to the immediate community. The following salient points emerged from this study:

I) Diverse motivations can initiate volunteers' participation within the community.

II) Joy and ownership increase with perceived competency at the tasks in the farm.

III) Guided attention can motivate learning associated with specific episodes on the farm.

IV) Broader perspectives are influenced through interactions with the community.

V) 'Performative' substances and 'Coagulative' practices are identified as key inducers of pro-environmental actions, as they embed and integrate a certain stance towards nature.

VI) Participants actions away from the site (such as making *Amrut-Mitti*, growing edible plants at home) can be considered the significant marker of motivation, because it indicates a persistent mental state that is activated in a different context (similar to the idea of ‘transfer’ in education).

Chapter 6 An enactive model of motivation

In this Chapter

A dynamic model of the emergence of motivation in individuals, based on interaction with artefacts and the community, is proposed. The model is inspired by recent embodied accounts of cognition, which propose cognition as emerging from environmental interactions. This model is extended to the evolution of practice-based motivations.

6.1 Discussion

6.1.1 Motivation as a dynamic entity evolving through community-based actions

The participatory study reported in the previous chapter provided insight into changes in individual volunteers as they began seeing their agency in farming-related activities. A 'personal transformation' was generated by the perspectives embedded in the practice, and these views were affirmed through peer feedback (Goralnik & Nelson, 2011; Hards, 2011). This led to the farming practice being understood in relation to wider environmental issues, such as food miles, seed sovereignty, water usage and increasing local biodiversity. My work thus highlights the importance of community-based practice as the unit for intervention, which facilitates the feedback required to sustain and expand pro-environmental action.

These observations are supported by recent views of sense-making, as inherently relational[1], and as a core component of social cognition (Jaegher & Paolo, 2007; Jaegher, Paolo & Gallagher, 2010). These views propose social interactions as enablers of the sense-making process, which simultaneously shape normative ideas regarding the world. In a

[1] The relational approach to cognition has its roots in the concept of enaction proposed by Varela, Thompson and Rosch (1991), and by Gibson (1979). This framework emphasizes interactions between sensory-motor capacities of an organism and its immediate environment as playing a constituent role in cognition. The emergent experience of the world is argued to be a dynamic enaction of the body-environment coupling.

similar vein, Ramstead, Veissière, and Kirmayer (2016) argue that social learning constitutes immersion in local contexts through what they describe as 'regimes of attention' that direct humans to engage with the environment in specific ways. Loaiza (2018), for instance, argues that, "*the knowledgeable skills are inseparable from the membership and identity of the individual within the group*... successful sense-making corresponds to *skilful* participation (emphasis original, p.5)." Our work shows how increasing and sustained participation of volunteers leads to an alignment of participants' perspectives with those endorsed by the founders of the community.

In related work, social practice theory has looked at practice as a unit of analysis, where 'doing' is an important component of the process by which behavior is transformed. This process is facilitated by interactions within the community. Lave and Wenger (1991) studied various communities of formal and informal apprenticeship, and provided an account of the community acting as a 'living curriculum' to disseminate knowledge among the participants, as they negotiate their way to become skilled practitioners. Our work shows that apart from knowledge, a practice also embeds certain normative views about the world, that gain traction based on sustained participation and feedback. Hargreaves (2011) offers a similar account, exploring behavior changes in employees of a construction company that had endorsed an 'Environment Champions' initiative. This initiative consisted of taking an audit of the environmental impacts of the organization, and implementing actions that could reduce the impacts. He observed how certain practices came to be valued and discussed amongst employees, and how inter-personal monitoring made sure no one backtracked. Such community-based monitoring of sustainable practices is also discussed by Ostrom et al. (1999) who studied how resource commons can be fairly shared and sustained if there are

personal interactions within the community, which allow for continuous feedback about one's actions. In this study, I found that valued 'coagulative'[2] practices of composting, making good soil, and saving seeds, slowly coalesce together, to develop an integrated view of the environment that is in alignment with wider perspectives held by the core members of the group. Increasing levels of competency at various tasks on the farm provide a positive motive to explore more actions in related areas, and an increasing number of concerns start making sense in relation to this growing process. This expansion of personal interests in turn drove further actions, thus creating a positive feedback loop between motivation and action. This was clearly seen during the 'Save a Leaf' campaign, which was initiated by volunteers to collect dried biomass for composting, and subsequently took the shape of 'right to clean air' when they discovered that leaves were being burnt at various localities. Sustained actions, enabled by performative[3] substances such as *Amrut-Mitti*, evolve into narratives that support views such as frugality, reuse and reduce. This is similar to the spill-over effects described by Thøgersen and Ölander (2003) who suggest that there is a likelihood of performing related behaviors in a cluster, such as re-cycling and careful consumption, especially if they contribute to one's social identity.

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2 'Coagulative' practices describe the convergence of seemingly separate ideas, such that participating in the practice allows one to understand the relationships between different entities involved. In the case-study, making *Amrut-Mitti* is described as a coagulative practice because it draws the volunteers' attention towards the interdependence of healthy plants and nutrient-rich soil, which in turn is created from the composting of excreta of livestock, organic biomass. Volunteers physically source these materials to make *Amrit-Mitti* and thus gain a visceral sense of the relationships (as opposed to just being given ready-made soil).

3 The term 'performative' has been historically used to describe language which can generate an action. It has had multiple uses in diverse fields such linguistics, gender studies, performance studies and anthropology. For instance Butler (1993) argues that gender is socially constructed through acts of speech, and body language that are performative, in the sense of defining and maintaining identities. More recently, the idea has been used to emphasize self-organising capacities of non-human processes and also critique anthropocentrism. These 'new materialist' (Barad, 2007; Bennett, 2010; Coole& Frost, 2010; Hultman & Lenz Taguchi, 2010) theories call for theorising of material as having agency, being politically charged, and as playing a constitutive role in 'knowing'. In our study, we use the term 'performative' in a more limited sense, to indicate embedded properties of an artifact, such that it enables certain actions (in this case towards the environment).

6.1.2 Proposed model of the process underlying motivation

The following diagrams (Figures 6.1 and 6.2) describe factors that facilitate the 'Artifact-Performance-Feedback-Coagulation' (APFC) model of motivation and action. The interactions are mediated by other factors such as experience, competency, sense of ownership and personal interest. The term 'ratchet' is inspired from its use in cultural psychology by Tomasello (2009), to describe the cumulative effects of learning within a culture. Here, it is used to describe how experiences with plants act as a ratchet to increase the possible sphere of actions (with episodes building on each other, such as responsible harvesting to seed saving). This is an iterative process. It should be noted that the process of growing food as a community lends itself as a particularly salient case, because it naturally embeds and integrates multiple components of the food system that are absent in commercial transactions. The continuous and evolving feedback available from the plants, space, and fellow participants also plays a significant role in strengthening desired (within group) practices and perspectives. Chandrasekaharan and Tovey (2012) make a similar point of how explicit representations can 'tether' actions by providing motivational elements to maintain desired practices. They further argue that 'tethered' structures also have the potential to motivate novel actions, as seen in the case study wherein composting leads to waste management practices.

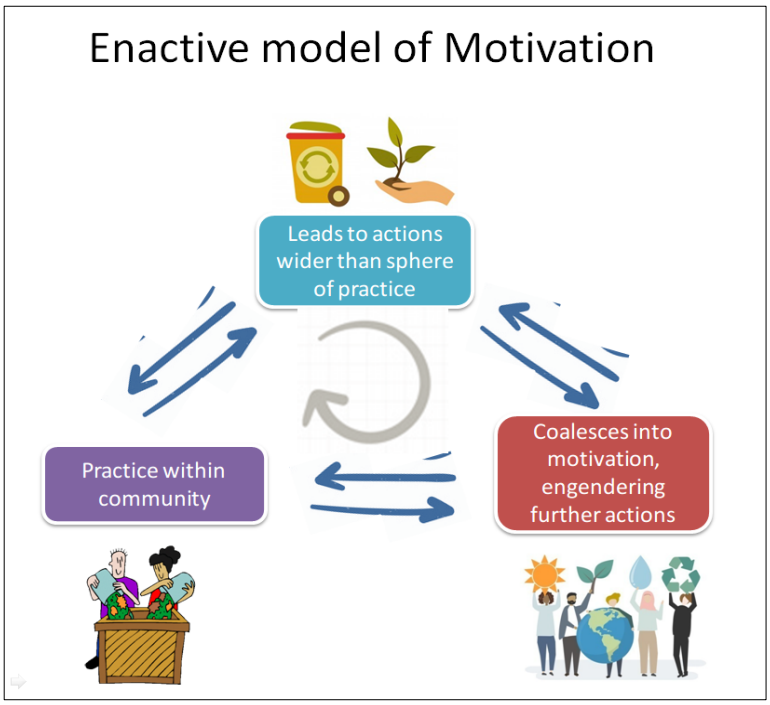

Figure 6.1: A model of how motivation develops from 'embodied' actions performed over time.

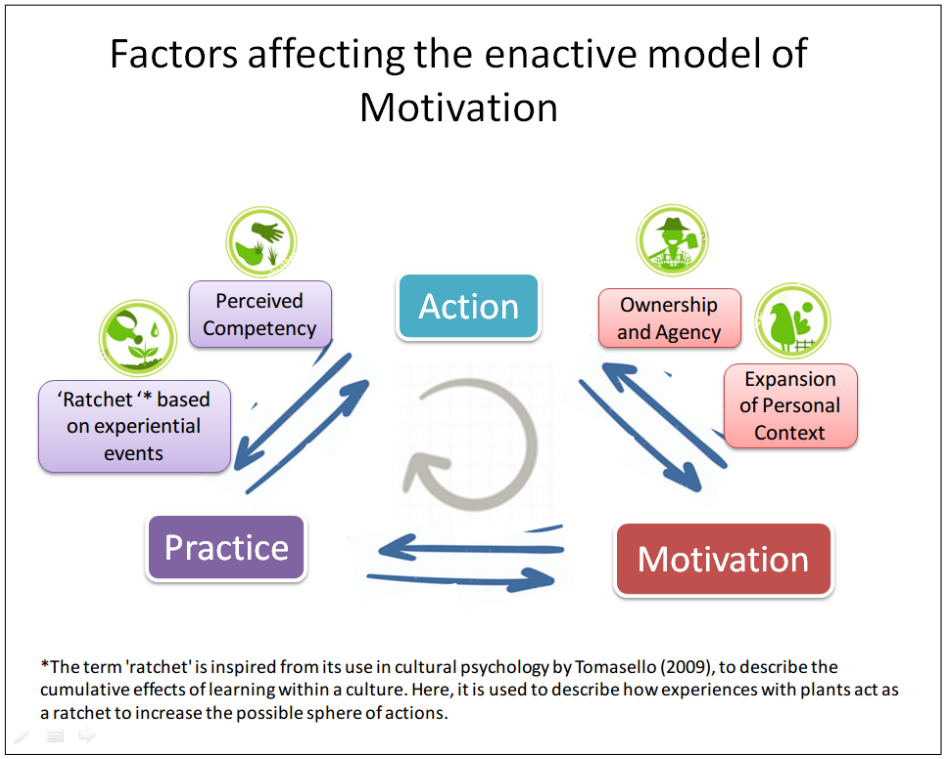

Figure 6.2: A description of factors that facilitate the APFC model. In the case of the farm volunteers, their perceived competency and experience within the community motivated wider actions, which in case positively affected sense of ownership and led to expansion of issues considered to have a personal impact. These led to further participation within the community.

This model extends the emerging embodied cognition framework to motivation, capturing the way practice and wider action feedback loops coalesce into motivation. This model is in alignment with studies in cognitive science which report how interaction with physical artefacts critically change the cognitive processes of participants (Hutchins 1995; Nardi 1996), and how material engagement enables and scaffolds development of social interactions (Gallagher, 2017). This should not be surprising given that our evolutionary capability to adapt to changing environments is based on building artefacts and tools (Ellis, 2015). Malafouris (2014) uses the term 'thinging' to highlight the cognitive processes instantiated in the form of thinking and feeling with, through and about artefacts. Using the example of a potter working with clay, he argues:

> "the classical mistake is to perceive the clay as inanimate and passive when in fact it is the source of the potter's agency and a psychoactive path of self-identification. By contrast, the notion of thinking suggests that only by looking at this performative transactional environment that permits and constrains movement (bodily and neural) can we even understand how the potter's intention to act comes to life." (Malafouris, 2018, p. 766)

Rather than acting as passive objects, artefacts afford a range of interactions, and the nature of interactions (burning leaves or composting it) embeds normative perspectives. Our work extends this theoretical view (Malafouris, 2004, 2013) to include the development of motivation, which are revised through interactions with artefacts of practice. Farming, particularly as a community practice, offers 'performative-substances' which help coagulate various environmental themes into normative narratives, and can thus provide engagements

that lead to development of resilient environment-oriented communities. Embodied and ecological practices such as farming allow the internalization of the integrative and interdependent nature of ecological relationships.

6.2 Implications for designing school-level interventions

Related studies show that first-hand experience of nature contributes to the development of pro-environmental attitudes (Chawla, 1999; Bögeholz, 2006; Birdsall, 2010; Cutter-Mackenzie & Edwards, 2013). However, there is relatively scarce empirical work investigating how the processes and variables involved in such activities lead to changes in motivation and values, particularly through interaction with environmental artifacts. Similarly, the role of a community in bringing to fore motivations, as well as unarticulated inclinations, needs further research. Compared to a focus on individual efforts, the exploration of actions in relation to a community has different consequences and interpretations. The findings from our study point to the possibility of a potential educational design with such characteristics, where community-based engagements nurture desirable actions and wider motivations among student participants. The engagements would be flexible, with broad goals of pro-environmental sensibilities, allowing students to explore and negotiate the significance of various contexts presented to them. Such engagements would also help rethink the popular idea that altruistic notions are the only possible drivers of environmental actions, and raise the possibility of pragmatic concerns triggering action that over time (because of the nature of environmental problems) leads to more 'publicly oriented' action. Our study suggests that interventions could also be more inclusive in terms of

participation, as a wide range of activities could contribute to the farming practice (as an example), such as planning, documentation, making compost, plant health and seed saving. These insights have been used to design a terrace farming project at a suburban school in Mumbai. The design of this intervention and its results are discussed in the next chapter.

Chapter 7 Facilitation of a school terrace farm (phase 2)

In this chapter

A school farming project was facilitated to gather further empirical evidence to test the model of motivation presented in the last chapter. Students' response to farming activities, and their subsequent actions, particularly in the wider community, was identified as indicators of successful implementation of the intervention. In order to generate an instantiation of the model, practice elements identified from the previous study were incorporated in the project.

Interviews with students and field observations suggest that sense-based interactions, instances of *enchantment,* and feelings of novelty and challenge were significant motivational triggers for pro-environmental actions. Students also reported expanding on their experience of growing plants at school, to initiate a variety of activities at home, through the help of grandparents in some cases. Interviews with parents revealed ways in which they got involved in some of the environmental activities through interaction with their children.

7.1 Introduction

Students need to be provided salient experiences of engaging with the local environment, to foster a situated and embodied understanding of diverse ecological practices. Within the structure of formal education, the notion of experience tends to get reduced to observations and ritual, which are episodical and uncritical. Activities meant to nurture environmental

sensibilities tend to take the form of tokenistic actions (planting saplings on Earth day, making 'Save the Tiger' posters etc.), without the possibility of any feedback or consequence. On the other hand, textbooks are filled with bleak scenarios of environmental degradation, leaving students acutely aware of 'big' problems, but education does not empower them to bring about any transformation in their own locality. Many educators have, therefore, argued for the need for 'authentic participation' (Jensen & Schnack, 1997; Hart, 2000; Chawla & Heft, 2002; Barrett, 2006), where students feel ownership, and take responsibility for the task at hand. This doesn't equate to unguided learning; rather, it is conducive to the building of collaborative learning environments, where knowledge doesn't have to be transmitted only from teacher to student. Rautio (2013) considers informal spaces of interaction between children and artefacts as a rich source for perceiving the interdependence of relationships. She sees such interactions as a move away from the narrative of environments simply facilitating children's agency in a directed fashion. She exhorts educators to "let go of our insistence on long-term accountability, evaluation and controlling of learning outcomes. We would need to trust that the interaction between children and the world, seemingly irrational and mostly unreflected, also has value. This value, arguably unmeasurable, could be thought of as intrinsic and grounding" (p. 402).

As a form of experience, food gardens are becoming an increasingly common feature of schools worldwide (Dirks & Orvis, 2005; Faddegon, 2005; Blair, 2009). They have most commonly been employed as a measure to positively impact children's health and nutrition (Duncan et al., 2015; Ratcliffe, Merrigan, Rogers, & Goldberg, 2011). Intuitive ideas regarding positive influences on student well-being, environmental attitudes, academic performance, social skills, and physical fitness etc. have also guided myriad gardening

programmes across schools (Lekies & Sheavly, 2007), though empirical research to analyse the impact of such interventions is relatively scarce (Mayer-Smith, Bartosh, & Peterat, 2007). Further, as Hayer-Connors (2010) notes, much of the research in the area of school gardens have focussed on evaluating the 'success' of these initiatives through quantitative, survey-based methods wherein a particular outcome (in terms of productivity etc) is fixed as the factor driving the process. Such studies are useful in understanding general trends, but fail to capture the 'messy', material relationships that don't lend themselves to simplistic categorisation. A different set of studies have focussed on the use of food gardens as a pedagogical tool to teach natural science, and other subjects (Green, 2013; Passy, 2014). However, this utilitarian approach to food gardens has been critiqued, for neglecting affective dimensions of children's relationships with the plants. Wake (2008) for instance, argues that most gardening programs are usually designed and maintained by adults, with children having minimal agency in imagining and developing the space. As a result, there is less research on the processes and nature of interactions underlying farming activities (Cutter-Mackenzie, 2009; Dyg & Wistoft, 2018). Ozer (2007) argues that “it is important that inquiry on school gardens extend beyond nutrition, to the potential effects of the psychosocial and academic development of youth and on the school as a setting for development” (p.861). My study is an attempt to develop a process-based understanding of student's close involvement in farming activities, and the potential of such activities in motivating wider ecological perspectives. In terms of initiatives, a number of alternate educational spaces in India have used farming as a central component of their curricula. However, most of these spaces have ample access to land, and have significant autonomy in terms of time allocation, deciding the

content to be covered and so on[1]. Additionally, a number of such alternate schools are also located in rural areas[2], where children attending the school mostly come with prior knowledge of farming practices. Research-based accounts of similar interventions in urban areas, and within conventional school set-up in India are rare.

Combining the open-ended practice possibilities of terrace farming with elements of 'performative substances' identified in the previous study, a class of VIII graders from a CBSE affiliated school (details in chapter 4) were recruited to set up an edible farm on their school terrace.

The project was ungraded, and the school managed to allocate an hour every week in the morning for the activity. Two teachers who usually handle the nature club in the school were also a part of the project. The school had two gardeners, who also took part in the project. Additionally, two facilitators were invited to initiate the project, in order to provide me more time for detailed observations, and field-notes.

7.2 Description of the school site: The roof with a view

"Wow! Are we going to grow plants **here**?!" exclaimed a student echoing the sentiments of many of her peers who rushed on the terrace, full of excitement. The excitement mostly stemmed from just the fact that they were being allowed to work in a space that was usually locked out of view for safety reasons. The terrace was completely barren, and offered a good view of the landfill that could be mistaken for a hill, with a decent green cover during the

1 Krishnamurti foundation schools such as Rishi Valley, Sahyadri school and Centre for Learning are well known alternate schools engaging in farming practices.

2 Educational set-ups such as Marudam, Thulir and Puvidham are located in rural Tamil Nadu. Sholai School is based in Kodaikanal. In the North-East, organisations such as Farm2Food Foundation have collaborated with schools on a large scale to improve nutrition and train students for farm-related entrepreneurial opportunities.

monsoon season. Student reactions ranged from curiosity to apprehension. The project was deliberately kept open-ended, with the broad goals of growing plants using the principles of organic farming, while using minimal resources. The project was not graded, thus encouraging students to freely engage with the project based on their interest. Every session would typically start with some observation of the surroundings, followed with discussion and suggestions for activities. Students usually worked in groups of 3-4, often forming even larger groups if they felt the need (for instance, activities like trellis-making required a large group to hold and tie the structure together). Major activities in setting up the farm included making a compost pit in the school grounds, collecting dried leaves to add to the compost and mulch the plants[3], making sapling planters, making cardboard planters, making supports for climbers and creepers, plant care, saving seeds and harvesting. Occasionally, a liquid called *Amrut Jal,* made from a mixture of water, cow urine, cow dung and organic black jaggery, was added to the plants to help microbial growth of the soil. The students also made a batch of *Amrut-Mitti* (as explained in Chapter 5) eventually.

Most students in the school had grown up in cities, and had fairly limited ideas about growing plants. Some had a few ornamental plants at home, but the idea that edible plants and vegetables could be grown in a small area was new for most of them. Students were allowed to explore, observe and play while participating in various activities. As a result, students had varied perspectives and motivations that evolved along with setting up of the terrace farm. Some students were initially unwilling to get their hands into 'dirt', and

[3] The number of plants kept increasing during the entire academic year. Initially, herbs and leafy vegetables such as Lemon grass, Cuban Oregano, Indian Roselle, Water spinach, Malabar Spinach, Mint, Amaranthus and Fenugreek were planted. These were followed by seasonal fruiting plants such as Okra, Brinjal, Tomato, Radish, Cabbage, Beans, Bitter gourd, Pumpkin, Tapioca, Millets, Bottle gourd, Sweet Potato, *Moong, Matki*and flowering plants such as BlueSpike, Marigold, Periwinkle, Dwarf Morning Glory etc. Some plants sprouted from the compost used in the farm.

preferred observing others. Some others had a more scholarly interest in the process, and would ask questions about the types of decomposition, how much time it could take, why didn't some seeds sprout and so on. A few others simply enjoyed the break from the routine classes, and would often comment that they found the activities very “peaceful”, and “relaxing”. Some students were aesthetically inclined and found themselves attracted to different shapes of the leaves, flowers, design of planters etc. Others enjoyed the physical exertion of working under the sun or weathering the rain. Some connected the activity with nostalgic feelings of rare visits to their native villages. A few were fond of gardening, and took to the activity without the need for any further associations. As a co-facilitator, I allowed for multiple modes of participation. Students would participate in whatever activity they felt most comfortable doing. As time passed, I observed shifts in the modes of participation. A timeline of the project with weekly highlights is shown below (Figure 7.1).

Figure 7.1 Illustration of weekly activities showing various stages of the farm along with the range of interactions in every session from June till October.

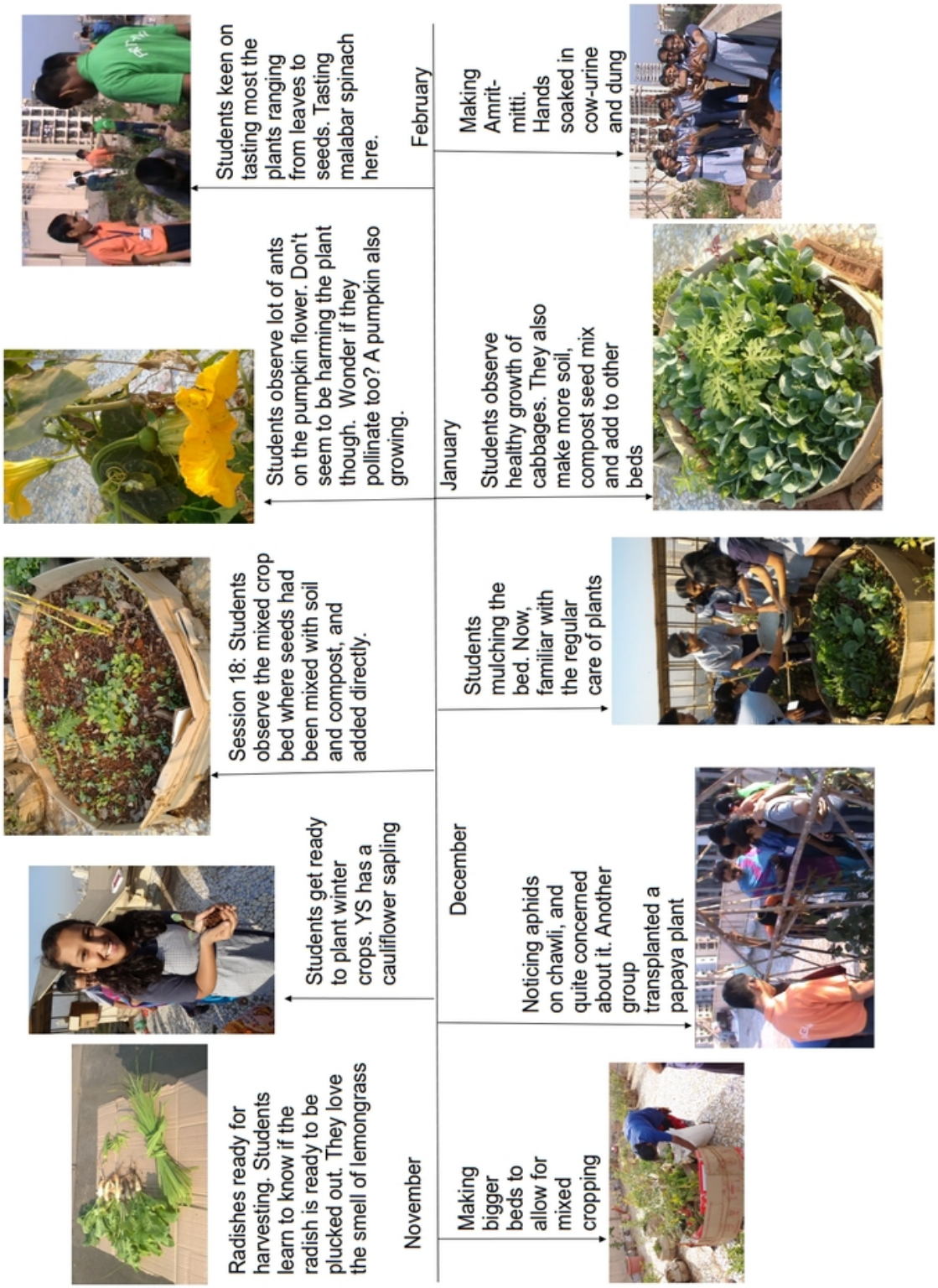

Figure 7.1: Illustration of weekly activities showing various stages of the farm along with the range of interactions in every session from November till March. Over the year, students observe type of food crops in different seasons.

7.3 Intervention design

The school terrace farm was set up based on the findings from the community-farm study. The study indicated that elements of practice that embedded a 'relational' perspective towards nature and encouraged peer feedback could motivate PEAs at a wider scale. 'Relational' here refers to a sense of connection with, or a way of understanding, other living beings where they are integral to one's own well-being (West et al., 2018). A key success criterion for the intervention was whether students initiated PEA away from the school farm site, as the previous study showed that this was a strong indicator of motivation.

At the community farm, the practice of collecting biomass and making compost deeply impacted all volunteers, who felt that the actions had helped them appreciate the importance of nutrient-rich soil. Hence, it was decided that students should also experience this process, rather than just using soil procured soil from a nursery. This involved sourcing organic matter from neighbourhood and school areas, thereby allowing them to understand the cycle of 'waste' to resource. As mentioned in section 7.2, Mulching of soil using dry leaves was also introduced as an active part of plant care, so that students could make connections between soil health, moisture and plant health. It also led to segregating plastic from organic matter, and gave students a visceral sense of plastic pollution in the immediate environment. Making *Amrut-Mitti* as a practice was also introduced, so that students got a chance to experience the use of cow-dung and urine as organic sources of microbes.

Use of organic seeds and seed-saving was also incorporated as important activities in order to make the idea of responsibility (growing crops next season) and autonomy (not being dependent on outside sources for seeds) more tangible. This also imparted a sense of abundance and diversity, as students could see how even a single plant could provide a huge number of viable seeds. Multiple varieties of a fruit or vegetable also provided a contrast to

the homogenous commercial variety seen in the market, thereby making the idea of seed diversity more accessible. This in turn meant more options for pollinators, and a chance for students to observe their interactions with plants.

Judicious and timely harvesting (in terms of when to harvest, what to leave for seeding) were also introduced as important parts of the farming practice, so that students could observe the plants closely and get a sense of the relationship between harvesting and the health of the plant. For instance, they would see how pinching flowers of plants whose leaves were considered edible triggered growth of the plant. It also ensured that the plant would not fruit prematurely and die. In other cases, they would learn how to know when a fruit was ripe for harvesting.

Other activities such as making planters, supports etc. were designed such that group work was needed in order to make the structures, and students could give each other feedback regarding the stability or functionality of the structure. They were encouraged to share their observations and freely interact with each other and the plants on the farm. A summary of the main artefacts and supporting practices used in the intervention is listed in the table below:

Materials on the farm	**Supporting Practices**	**Embedded perspective**
Nutrient rich soil	Collecting dried leaves and organic waste, making compost	Recycling of nutrients, redefining waste as resource
Dilute cow-urine, dung, jaggery	Adding to soil and compost	Microorganisms as a core part of soil; symbiotic relationships
Seeds	Saving seeds	Maintaining cycle of life; seed sovereignty; stewardship
Planters	Designing low-cost planters; making trellises	Frugality; resuse and recycle; local sourcing of materials
Fruits and Vegetables	Responsible Harvesting	Stewardship; responsibility; reciprocity
Dried Leaves and Bagasse	Mulching and lining of beds	Recycling of nutrients, soil care

Table 7.2: Broad design plan of activities on the farm through use of artefacts and living materials.

A session began with students observing the farm and having a quick discussion amongst themselves followed by a quick recap of what was done last week. Then, tasks for the day would be listed, and students were encouraged to come up with their own tasks based on the observations. After about 10-12 sessions, many students could plan their own activities, rather than waiting to be given directions, and seeking only specific guidance from teachers.

7.4 Brief description of the students interviewed

Forty students (19 Girls; 21 Boys) participated in the project. They usually worked in groups of 2-3. Questionnaires were administered to all the students before and after the intervention to understand if they had prior experience of farming activities, and what changes they perceived after their participation. The school caters to middle-class students. Most students reported living in residential apartment complexes close to the school premises. Apart from field observations and questionnaires, in-depth interviews were conducted with one student from each group (totaling 14). Brief descriptions of these students are provided below.

AM

AM had a neutral stance towards farming activities in the beginning, but started taking interest when every student got a chance to make saplings and grow them in larger planters. She would often ask facilitators for specific help in terms of methods, and would try to follow it. She was very happy that she and her friends earned the nickname “The mulching trio” because they were particular about mulching the plants properly, having learnt it from the facilitator in detail, and would teach their classmates to do it. Often, on their own, they would stay back after the sessions to walk around the farm to check if the plants were

mulched. AM's parents visited the farm a couple of times, and were very appreciative of the initiative. AM showed them around the farm, explaining the uses of plants, and how they had grown them. She later said that she felt very proud of the farm, and that she hoped they got a chance to continue working on the farm the next academic year.

DV

DV was mildly interested in farming activities, but it was more out of curiosity to know "how" and "why" different things were being done. He would observe the activities closely and have a lot of questions such as "how do we know this is aerobic composting?", "Why are the fungus growing on the wet cardboard?", "What will happen if we use hybrid seeds?", "Why does the tomato stem have hairs?" etc. However, at least initially, he would avoid getting involved in any particular activity, especially if it would require getting his hands dirty. His friends, on the other hand, were more enthusiastic to participate in the activities, and over a period of time, DV began participating too. The initial dispassionate interest turned into a more involved concern about the welfare of the farm when a few plants succumbed to diseases and pest attacks. He mentioned that his mother liked plants, but he wasn't as interested earlier. After working on the school farm regularly, he began to take a much more active interest in working as well as reading more about different plants, pests etc. He would read up and ask regarding other methods such as aquaponics. He said that he likes building things, and so was excited to try more innovative methods to grow plants. A teacher later mentioned that he had approached the principal to get a fish tank, and wanted to make a small aquaponics model farm as a project.

HA

HA is playful by nature, and naturally took interest in activities that involved being outside the classroom. So, the idea of building a terrace garden had an instant appeal for him in terms of being able to spend time outdoors. He lent a light atmosphere to the group by indulging in good-humoured fun. On the first day that the group went to the ground to collect dry leaves, he and his friends collected a large pile of leaves, which they brought near the compost pit while acting as pall bearers, because the leaves were “dead” and they were going to “bury” it. He grew more serious and involved in the project, when he felt it made practical sense for him to use organic waste and grow vegetables that could be eaten. Later he did a door-to-door campaign in his society to collect cardboards that could be used as planters. In the process, he ended up explaining to many neighbours why he needed the cardboards, and found out that they were very appreciative and supportive of the project. He mentioned feeling good about it and wanted to participate more actively. He would always be looking for some physical task to be done, and enjoyed doing it. DV was one of his close friends, and he started taking more interest after seeing HA's enthusiasm.

AN

AN began as a passive observer of the terrace farming project. She mentioned that she wasn't particularly attracted to plants earlier, and was also a loner. Her close friend had apparently left the school a few months back, and she was having trouble connecting to other classmates. She started taking more interest in the farm after she planted a sapling and saw it growing well during the monsoon. She also began taking part in group activities, and later remarked that being able to make friends during the time spent on the farm really helped her.

The farm activities also gave her many topics to discuss with her parents, and also her grandmother, who happened to be very fond of gardening. She grew to like the farming space, and remarked that it was a very peaceful atmosphere for her. She later took an active part in starting a small communal kitchen garden in her own residential society.

KN

KN was interested in farming activities right from the beginning. He was shy and sensitive by nature, and was often spotted telling more boisterous students to handle saplings more carefully. He mentioned that his parents were also fond of gardening, and they had many plants at home. However, he had not grown edible plants before, so he was very interested in learning different methods. He often took seeds from the farm to try growing them at home. He likes spending time simply tending to the plants, and would usually stay back to help clean the farm space or complete other odd jobs. He was also among the students who came to the farm during the vacation period to take care of the plants. He mentioned feeling very happy seeing the transformation of the terrace from a barren space to a more welcoming area. He also liked the increased presence of bees and insects in the area, and remarked that in the future he would like to grow more medicinal and rare plants that could be in danger of becoming extinct.

LK

LK belonged to a group of students who were actively disinterested in the terrace farming project. She said she didn't like getting her hands dirty, and didn't participate in the initial

activities of compost and sapling making. One of her friends, however, still made a sapling for her. The sapling was that of dwarf morning glory, and later had tiny blue flowers. She mentioned that seeing those flowers blossom was the first time she took some interest in what was going on at the farm. She said she liked “pretty” things and started getting involved in activities that had some aesthetic dimension like laying out the harvest, making bundles of lemongrass, etc. She also began finding the caterpillars and snails “cute”, though she was still scared to touch them. Towards the end of the year, she was considerably more comfortable handing soil, and even assumed a leadership role in directing other students to complete different tasks more efficiently. She was already one of the more popular and dominant students in the class, so her increased involvement in farming activities led many students in the group to participate more seriously. She mentioned that her mother was very happy to see her involvement, and had encouraged her to participate with more interest. She tried growing a lemongrass sapling at home. It grew well, and she felt very proud of being able to grow it. Later, she was one of the more vocal campaigners in some local events held at the school to spread the idea of terrace farming in the neighbouring residential apartments.

MH

MH was excited about being part of the terrace farming group right from the beginning. She mentioned that some of her relatives had some land in the outskirts of the city, and she loved spending time there. She was very disheartened to see some plants getting infected, and wanted to learn methods that could prevent such incidents from happening. She would always be eager to participate in any activity possible, and would try and spend as much time as possible on the farm, even after the session ended. She mentioned that she tried growing

fenugreek (*methi*), cabbage, aloe vera in cardboard planters at her home after her experience at the farm. She liked working with others on the farm, and mentioned being able to participate together as one of the most enjoyable parts of the activity.

AY

AY was ambivalent regarding the activity at first, and would often prefer simply observing various tasks on the terrace. He was part of a boy-scout group earlier, and started taking interest when he realised that many of the knots he had learnt as part of the scouts could be used to tie ropes for making trellises. Soon, he began taking up more responsibility, and took lead in making various kinds of support structures for plants. He took a particular liking to herbs that were being grown, and mentioned wanting to grow them at his home too. He also reported taking more interest in composting activities being done at his residential complex. He was also enthusiastic regarding reusing of plastic bottles as small planters, and would often do small collection drives near his home to get more material for planting on the terrace. He felt harvesting was a big motivation for him to grow more plants on the terrace.

RC

RC mentioned that she had grown up in the city, and had no relatives in rural areas. So, until her participation in the project, she had never thought much about plants in general. She mentioned the exposure as being so novel, that she immediately took interest in it, mainly out of curiosity. She felt that her engagement with plants had led her to notice her surroundings more keenly. She took interest in knowing the names of plants, and learned how to identify them. She had an interest in chemistry, and wanted to know more about the chemical

reactions in composting. She felt it was fascinating to actually see something that she had only read about till then. She mentioned that her participation in the farm activities led her to take interest in a small project at her residential society, wherein each family was encouraged to plant a sapling. She sowed some mustard seeds as part of the project. She reported feeling motivated to engage seriously with recycling projects after her experience of segregating non-biodegradable waste from the compost and leaf litter.

NM

NM liked being outdoors, and was generally fond of physical activities. He mentioned that he didn't think much of the activity initially, and had never taken care of plants, though his mother had many ornamental plants at home. He started taking interest after the trellis building activity and tasting the edible plants on the farm. He felt that most of the ideas regarding the making of planters, mulching etc were quite new. He took active interest in sourcing cardboard boxes for the farm, and making planters from them. He reported having a 'love-hate' relationship with Lemon Grass, because he liked its smell, but would often end up hurting his fingers when running them through the sharp blades of the grass. He commented that he had started taking an interest in the prices of vegetables while accompanying his mother to the market, and he thought about the effort going into growing food.

RN

RN had no experience of tending to plants before participating in the farming project. She initially had some reservations about handling compost and soil, but became more comfortable in the subsequent sessions. Her interest in different activities increased after her

sapling, which seemed to be dying, revived after the dead stem was pruned. She observed it closely, and reported that fresh leaves had grown from another node. After this episode, she started observing other plants closely as well. She liked telling her mother regarding the farm activities in detail, and had tried to grow some edible plants at home. She enjoyed seeing insects on the farm, and was one of the few girls who wasn't scared of touching them. She took part in seed-saving activities and as a result was careful in harvesting fruits, often asking if a fruit should be left for seeding. She felt proud that the group was able to transform the space within a year, and mentioned that she would like to continue participating if given the opportunity.

SM

SM was a cheerful girl, and naturally took a liking for various activities, despite the lack of experience in growing plants. She mentioned enjoying “playing” with plants and “taking care” of them. Her playful behaviour involved spraying leaves with water, and observing how the droplets would slide off the waxy leaves. She also discovered that the pulpy seeds of Malabar spinach had a rich purple colour, and mentioned that they could play '*Holi*' (an Indian festival of colours) with it. She regularly brought dry leaves from her locality for making compost. She enjoyed group activities, and was especially enthusiastic to show other teachers the harvest of the day. She felt that the vegetables grown at the farm tasted better than what her mother got from the market.

SS

SS was one of the few students with prior experience growing edible plants. He mentioned

that his mother's interest in growing plants had led him to enjoy the activity as well. As a result, he would often lead groups of students in different tasks, even encouraging the less interested ones to contribute. He mentioned feeling happy when one of his classmates became much more enthusiastic regarding farming activities after interacting with him. He would often stay back to water the plants, or clean up the terrace after a session was over. He was unhappy that his residential complex, after a renovation, no longer allowed keeping pots etc. in the balcony, since it could spoil the newly painted wall etc. He liked visiting his grandparents' home, because they had a backyard where he had grown many plants. He mentioned paying more attention to insects and understanding their roles in pollination, pest-predator relationships better. Before his experience on the terrace farm, he didn't think about the quality of soil and its relationship to micro-organisms. He felt it was a new learning for him. He commented on wanting to take up farming more seriously once he grew up.

YS

YS was not very keen to participate in the beginning, because she was hesitant to get her hands dirty. She did not participate in sowing and transplanting, but slowly got interested in harvesting. She liked the smell of herbs such as Mint, Lemongrass, Spearmint etc, so she made sure that these plants were watered well. Eventually, she was comfortable poking her hands in the soil and took interest in plant care. She mentioned that she had stopped wasting food after working at the farm, since she realised the amount of effort that it took to grow even a small amount of vegetables and fruits. After her experience at the terrace farm, she asked her parents to get some plants from the nursery. She mentioned that they were not keen, but she convinced them that she would take care of the plants. She felt working at the

farm had brought some change amongst her friends as well, who earlier were aloof. According to her, they had become more friendly and liked working in groups.

7.5 Students' interactions at the farm – Emerging themes

7.5.1 Somaesthetic Interactions

Students were observed engaging with plants in a rich, visceral manner, through senses of touch, smell and taste, thus widening their modalities of perceiving the environment. To illustrate, students had never seen the plant called Indian Roselle (locally called *Ambadi*). It was grown on the terrace, and they were informed that the leaves of the plant are edible. Initially, for most students, the mere idea of eating something directly off a plant was a novel concept, given that their interaction with food is mostly in packaged, frozen or cooked form. However, apprehensions gave way to curiosity, as they began to sniff, taste and finally nibble the leaves tentatively. The sour-tasting leaves went on to become a garden favourite, as evident by frequent comments like,

"leaves taste so sour… And I liked to eat it!" (AM)

"we used to come everyday excited for terrace farming but the main reason was that we would get to, used to actually eat the plants. There was that ambadi plant, it was sour and we also actually opened up many of those , you know, the containers not containers actually, but the parts in which the seeds were held. And we got to see, the actual seed and it was like 'wow, this the entire plant grows from this!'" (YS)

Heesoon Bai (2013) argues, instead of appealing to vision-based discursive categorisation of the surroundings, a more sensuous perception arouses a participatory consciousness, and nurtures an emotional relationship. This process was seen at the farm, and it encouraged students to taste other plants too, and discuss other locally grown edible plants (like *shepu*'Dill', *lal math* 'Red Amaranth' etc) that they hadn't seen or tasted earlier. Students began identifying plants based on sensory interactions, such as “waxy leaves”, “thick leaves”, “minty taste”, “sour taste”, “sharp leaves” and so on. For instance, when asked regarding if they could recognise different plants, a student commented,

“*Yes, a few plants like Ajwain, Bluespike, Lemongrass. Tomato plants because tomatoes have grown on them (laughs), Papaya because of the leaves, but I still can't recognise it properly. Water cress because of the waxy leaves, Mayalu because of the ripe purple seeds that have come on them...we had a lot of fun, we were just squishing it and putting the purple colour on our hands.” (SM)*

The experiences were not always pleasant, though students seemed to take it in good humour. Here, a students describes the sharp edge of lemongrass leaves,

“I was not very very familiar with this lemon grass, ya I knew it is used for some tea and all but just last three and four classes back, I understood that it can cut skin also, I experienced it!(laughter)” (NM)

Using the body as an “organising core of experience” (Shusterman, 2004, p. 51) accentuates the immediacy of experience, along with a growing sensitivity to anticipated changes in the surroundings. The continuously evolving landscape of the terrace, through the growth of plants, turned into a motivation for students to explore the surroundings in a somatically grounded fashion. As a student later commented,

“Because even in gardens you see so many types of plants, but to me they were just all green, just green, a patch of green. But now I can actually like sort of at least remotely recognise that this plant is this , that plant is that and all those things.” (RC)

A 'patch of green' gaining its unique features forms the basis for further engagement and understanding of one's environment. Iared, de Oliveira, & Payne (2016) assert that eco/soma/esthetic perception stimulate ontologically rich ways of relating to nature, which otherwise remain untapped in discursive modes of knowledge acquisition. For instance, interactions with the growing *Ambadi* plant tuned students' attention to factors promoting the health of the plant, signs of it being diseased, time of flowering, saving seeds for next season, and other related activities of plant care.

Many students were initially repulsed with the organic matter kept for composting, but began shedding their inhibitions after seeing their saplings grow in the compost. In subsequent sessions, they noticed that the compost, once prepared, had a sweet smell. Then, they began taking active interest in compost preparation, and would often smell it, feel its texture, and poke around to look for earthworms, the presence of which would generate a lot of excitement. The regular activity of handling soil drew students' attention towards its

texture and form, eventually leading them to observe it more closely.

"So now, wherever I go I don't decide just by looking at the soil… If we see from above it is wet, and actually when we put our fingers we can feel it is pointy, lumpy and dry inside... So I feel the soil now..." (DV)

Given that they had started out with a bare space, the emerging life-forms and relationships initiated more actions to encourage further growth. Such engrossed participation prompted a student to remark,

"*we never even touched plants this way earlier... I mean we play on the grass, but not this way. To take care.. this time we learnt how to grow the plant, otherwise it is said that just drop a seed and the plant will grow... the book says that… but now I think the book is very fake, because the book only says what the author can see, but while doing it we see many different things." (AY)*

Bonnett (2007) critiques formal education pedagogies for its emphasis on abstract knowledge by describing schools as places of 'unselving', wherein particular histories and connections with the community, land and local context tend to get marginalised. The student's perception regarding the fakeness of the book is indicative of the gap between experience and information.

7.5.2 Instances of 'enchantment'

Students often found themselves awed by various experiences at the farm. This was evident in the way they would completely immerse themselves in the experience, often losing track of time until someone or something else interrupted the interaction. There was a strong affective component to these instances, and all experiences weren't necessarily pleasant. For example, in one session during the monsoon, some students were completely taken aback by the sight of small wild mushrooms that seemed to have grown overnight (figure 7.3). They went about trying to touch them, fascinated and slightly disgusted at the same time, because of its almost alien-like growth on the wet pieces of cardboard planters.

Figure 7.3: Mushrooms seem to grow magically during monsoons

Another phenomena that captivated their attention was the fruiting of flowers, with swollen ovaries and dried petals. Despite 'knowing' the process through textbooks, the actual observation turned out to be a novel experience for them, as one of the students exclaimed in a moment of epiphany, "*Oh, this flower is pregnant!*". The shift in view from standard images in biology to attributing a state of life to the plant (as it being 'pregnant', and need of care etc) seemed to be of significance for the students, in relating to the plants.

The soil itself became a source of wonder when students spent a lot of time digging, sifting and mulching it. Often, dried leaves used as mulch earlier would have partially

decomposed by the time they visited the farm next, and they would spend several minutes gently picking up and admiring the patterns formed by the bare leaf veins. Seeds germinating from the compost pile made for a moment of awe, as students gingerly picked it up from the pile, closely observing the fragile roots and a single leaf on the verge of emerging from the cotyledon (figure 7.4).

Figure 7.4: Observing exposed roots of a sapling

A variety of insects and worms would also catch their attention, often in the form of slime trails all over the farm. In fact, many students had these spontaneous "bug rescue missions" wherein they looked around for worms crawling on the terrace, and put them back in the soil, to save them from getting trampled accidentally. Even snails, usually considered a pest in gardens, won their affection, as one of the students actively defended it by saying,

"*We can give it some fresh leaves to eat too. We don't need to harvest everything!" (SS)*

The variety of seeds on the farm arrested their attention, especially when they had to sow or save seeds from the harvested fruit. They would roll the Okra (bhindi) seeds on their palm to feel its hairy texture, and had a lot of fun from squishing ripe seeds of Malabar spinach,

which had a rich purple colour. They would hold the numerous tiny seeds of Amaranth, trying to estimate how many more plants could grow from all those seeds. The amazement is evident in the following remark by a student--

> *"one seed can grow into one plant and we get so many seeds from it! Hundreds of them..." (AM)*

Students came to treat seeds with a lot of care, and ensured that seeds were collected carefully, often spending the entire session just storing them in packets for future use. Students got seeds of fruits they consumed at home because they were curious to see if those seeds would sprout. So, many of them started bringing apple seeds, date seeds, mango seeds, chickoo seeds etc. on the farm, excited at the possibility of the seed sprouting. As an outcome of their increased attention towards seeds and saplings, many reported using seeds from their kitchen at home to try growing a few plants such as Green Gram (Moong), Mustard (Sarson), and Fenugreek (Methi).

Such encounters allowed for spaces of intimate, non-representational forms of connection with the farm. Bennett (2001) uses the term 'enchantment' to describe such affectual moments, and argues that such encounters are critical in seeding empathy and generosity towards the more-than-human world.

7.5.3 Motivational Scaffolds

Novelty

Interacting with new entities, and different ways of using them, encouraged many students to pursue activities on the farm with more interest. Most of them recounted that different facets

of the farm, (ranging from plants, to supporting artifacts like plastic bottles and trellises) kindled their enthusiasm to explore related tasks. Many students were intrigued by soil, and often commented how they had never noticed the texture of compost and soil until they handled them. The sustained interactions eventually led them to feel comfortable with this activity. In some cases they even perceived a sense of competency, in being able to decide whether the soil was too dry or needed mulch etc. The novelty factor is evident in the following comment by a student:

"*This* (farming) *was something I was doing for the first time because I have never lived in a village, so I have never been to a farm as such ... I was very excited to get my hands all muddy and make all those planters." (RC)*

Children were encountering many plants for the first time, and found themselves growing more interested in activities as they followed the growth of the plants. To illustrate, a student had transplanted a sapling of dwarf morning glory, which later grew and flowered, attracting many bees on the farm. The student was extremely happy seeing the plant blossom, and said:,

"*I spoke a lot about my plant to my mother because it was something I had never really seen before. It was new to me." (RN)*

Similarly, another student recounted:

"Like 'bhindi' ko first it should be dried and then the seeds should be taken, then I never

knew ambadi, I learnt that. Then many new plants also like, Malabar spinach and all I didn't know, then pumpkin flowers also. I had seen those plants but I didn't know it was pumpkin." (HA)

The re-use of entities like discarded plastic bottles (as sapling planters) turned out to be another surprise for them, as a student (NM) commented,

"we have never seen plastic bottles being used to plant..." (KN)

Following this, students explored and experimented with different designs and materials for making planters. Many other events on the farm turned out to be new experiences for the students, and these experiences built the motivation to search for something new, as an artifact, skill or sensory experience. Overall, the novelty of the encounters at the farm seemed to encourage students to actively seek newer experiences, and this process generated further interest.

Challenge

Students found some tasks challenging, such as figuring out how to provide support for climbers by tying up bamboo poles, and reinforcing cardboard planters so that they could survive the monsoon. However, the challenge motivated them to work out solutions that could be applied in the given context. They made tripod designs and engaged in collaborative work to make other structures that could be used on the farm. They reported the process to be quite enjoyable, perhaps owing to the fact that it involved peer validation, and also a tangible

outcome of having a stable support for the plants. As a student commented,

"*then most important was that trellis… making it was a fun job because we were trying different knots that we knew but had never really used. So, it was a very enjoyable… we can see, explore plants and see different properties. Then that pumpkin. I like that pumpkin because it in the middle of the plant... all the pumpkins are usually on the ground, but this was on the trellis... I am seeing it for the first time." (AY)*

They experienced first-hand the complexity of conditions under which plants grow and produce fruits. They saw many plants contract various kinds of disease, ranging from aphids and mealybugs attacks, to leaf curling, fungal infections, premature ripening of fruits, and so on. The causes wouldn't be apparent most of the time, so they would try different solutions after discussion with facilitators, such as application of wood-ash, spraying with cow-urine, spraying with neem-oil, mulching the plants etc. They started appreciating the breadth of knowledge any farmer needed to have to tackle all the issues of the growing food. The unpredictable, open-ended, and systemic nature of the problems constituted a type of challenge that they were not exposed to in the school otherwise. Their investment in terms of effort also reinforced a sense of ownership and responsibility towards the farm.

Many students eventually grew attached to the farm, and in the process challenged their initial fears or disgust towards entities like cow-urine, cow-dung, and insects. Here a student describes overcoming her fear towards insects. Her justification to accommodate a tolerance for the insects points towards an increased empathy for the plants;

"If it's good for the farm then it's good for me, then I am happy. Because even if we call this our farm, it is our farm, but it is the plants who are in need. Because they give us what we need so it is our duty to give them what they need. So if they want insects to come and pollinate or something like that, then it is okay, I am happy as long as they are happy." (LK)

Sense of purpose

Students enjoyed the open-ended design of the activities, particularly since their opinions were sought in terms of how they wanted to set-up the farm. Minimal guidance was provided, and only when required. This freedom also resulted in them assuming responsibility for the upkeep of the farm, and they would often stay back even after the session was over. They often sacrificed recess time (lunch and free time in school) to finish a task, or volunteered to come during holidays to ensure that the plants were taken care of. One of the students spoke about the experience, contrasting it with other outdoor activities done at school:

"*this gives us a lot of liberty and freedom to do what we want to… we are choosing the seed we want, harvesting many plants. In school you have a large number of children, so work has to be divided equally to everybody. Then because there are many children, you don't get a lot of work, you just do something small, then you sit down. Here, there is so much going on continuously that, if one thing is over then you can go into the other and help them out. So it is really nice." (MH)*

This comment resonates with the observation of Louise Chawla (2002), that environmental

affordances that promote responsible relationships, and opportunities to take responsible roles in community settings, are integral to nurturing children's agency in society. In one instance, students contrasted the terrace farming activity with other environmental activities in the school, in a way that was critical of the latter:

"I mean at least the cardboard can be used... instead of dumping... and we are using it for vegetation, not just growing plants... in school, we have had that 'best out of waste' activity... In that we use Colgate box to make pen stands and other things... so but here we are growing plants out of cardboard…so it is of more use... I mean today no one uses cardboard compass boxes but vegetables we need! This is so useful!" (AM)

"Most of the times other activities as such we just went to visit places, so we weren't allowed to touch things we were just allowed to observe and the person would just tell us about some information, then we noted down and then we forget about it. So this was actually getting our hands into it, actually growing something. So this was quite different." (RC)

Hart (2000) describes the importance of authentic participatory experiences, which allow students to understand the gravity and relevance of their actions. These experiences differ from conventional school activities, which often focus on products rather than the process of participation. Students are able to perceive the shallow impact of such activities, and consequently disengage from such activities, thus defeating their purpose.

Feedback

The evolving landscape of the terrace farm became an interesting form of feedback for the students, who started noticing different aspects of plant growth, as evident in a remark made by a student:

"*we studied that the tendrils wrap around the support, but now I actually saw how it wraps itself… we hadn't learnt about grouping plants like this… this is new, we haven't studied like this... I saw the good effects also… Like that ajwain plant needed some shade… under full sun it didn't have so many leaves… now under a bit of shade it has grown a lot...*" *(YS)*

Episodes of seeds sprouting, plant fruiting, and noticeable recovery of plants from infestation seemed to lead students to feel markedly more involved in farming. As one student commented:

"First I was kind of bit bored because I didn't want to do it, because of the mud and all I didn't like it, I didn't even plant the first sapling that time... but after the plant started growing I liked it. Every time I came it had grown more leaves!" (LK)

Similarly, another student shared the way she managed to overcome her initial discomfort with handling cow-urine after seeing its positive effect on the plants:

"*First I felt that goumutra (cow-urine) was quite yucky, but then I saw that Ambadi having mealybugs was doing better after we applied it. Then now I understand that it is nice.*

It is very helpful for the plants." (YS)

Many students could see the direct impact of their actions on the plants and their surroundings, thus prompting them to take more interest in related activities, such as composting, drip-irrigation, mulching etc. Further, these activities became an interesting topic for discussion at home, or with other teachers in the school, where students felt a sense of accomplishment and joy in sharing their observations and learning. The positive feedback received from parents and other individuals encouraged students to continue sharing their experiences at the farm. As one student commented:

"like on one of the Saturday we had science period, and we told the teacher what we are doing on the terrace... also we were very enthusiastic to tell our granny (lady employed in the school canteen) *what we are growing, we have discussed it with everyone.. They are very happy" (DV)*

An interesting type of feedback involved students' perception of each other, in terms of how it helped in creating social norms of collaboration and sharing. To illustrate, many students working together felt that their friends had become more helpful and interested in farming, while stressing that the activities on the farm require team-work. Here, students share their observations about their peers.

"KS became more responsible and helpful... he wasn't that interested earlier. MH started has also started noticing lot of things and asks lots of questions now..." (TN)

"TN didn't want to put her hand in mud but later started enjoying it. NM is usually lazy when there is any work to do together, but started working hard on the farm … We have to ask him to let us water the plants sometime!" (MH)

"My friend never took interest in what others did, but that day he took charge and helped others tie knots for the trellis" (DV)

"AD used to be very quiet in class... I think because he had just shifted, and he comes from a village in Ahmednagar. He had told me that his father is a big farmer, but never spoke much. Now, after we have started working here, he tells everybody what all he has in his farm and how he has seen many plants and all... yeah, he has changed now." (NM)

Students bonded over the activities on the farm, and became more appreciative of each other even outside the farming sessions. The collaborative nature of the activities also contributed to a shared identity as a farming group, as evident from remarks such as these,

"We all had decided that we will be very proud of ourselves when we grow a lot of vegetables and whenever we harvest them and we show it to our teachers... we feel very proud and they also always praise us." (SM)

"I liked seeing my friends so happy when they harvested the vegetables. We are the first group to do this activity in our school... I feel happy we could do it together." (DV)

"Here you get to spend plenty of time with plants as well as other people. You share experiences that people know and you listen and share your experiences as well... You get to work with people who you don't really interact with as well..." (HA)

7.5.4 Actions away from the farm site

Students reported diverse ways in which their immediate community became involved in different activities related to the farm. Out of 40 students, 36 reported engaging in some level of activity away from the farm site (Figure 7.5). This suggests the intervention was effective in nurturing students' motivation to engage in PEA.

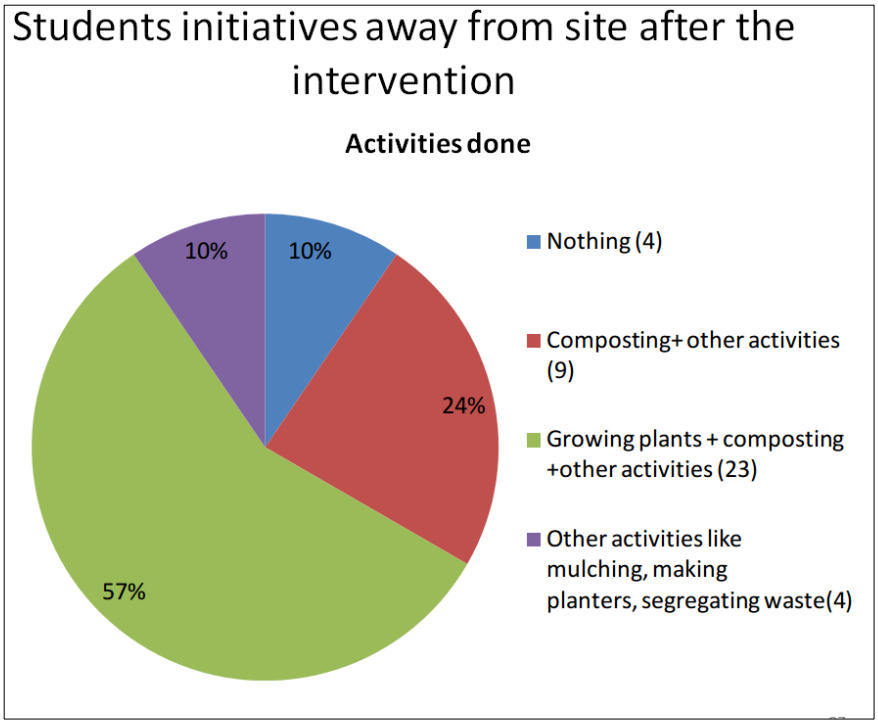

Figure 7.5: Percentage of students involved in off-site activities post the school-farming experience

Often, students would describe their interactions with parents based on their experiences on the farm. They made associations with plants grown at the farm and tried growing some at their house as well. Many students took saved seeds and saplings from the farm to grow at their home, as illustrated below:

"We usually buy lemongrass from the market, but then I saw we are growing so much here. I told my parents that we can grow some too. So I took a stalk from here, and have planted it in my balcony..." (LK)

"I have just grown a sapling of Bhindi, because I have seen Bhindi is growing well here... I have tried it. It is the process of growing." (AM)

"I told my parents we should grow tomatoes because I liked it. That day, I ate a tomato here. Then I went back home and had a tomato that my dad had bought, I could taste the difference between both of them. So, this was very sweet and really fruity, juicy, that was really 'kadak' (hard) and it was really hard to have it. I usually don't like eating tomatoes raw, but the farm one was nice!" (SM)

Students reported trying out related activities such as composting, leaf-collection, mulching and recycling, often drawing their parents into the discussion or physically helping them out. To illustrate, a student explains how she told her mother to mulch plants after observing the process at the farm.

"Usually my mom grows plants in a bucket, so she just pours all the soil. After I had attended first 3 or 4 sessions here, my mom had bought a small rose, and she just took the soil and manure and just put it. So, I told that don't do it like that, put a layer of leaves and then the soil, and it will grow well. So, she tried that and our rose plant has many roses now... They say it (terrace farming) *is giving me a nice experience. And like, they also didn't know about mulching... what actually it is, but now they are learning it from me." (AM)*

The student felt proud of being able to 'teach' her parents that they seemed unaware of. The prospect of sharing new methods and ideas with her parents led her to participate in various farming activities with a lot of interest. Similarly, another student describes how he convinced his mother to stop discarding cardboard boxes so that he could get them to make planters on the farm,

"I wanted to make planters, so at home I said, "Mummy, kuchhbhi cardboard ka piece hai kachre mein mat daalo." (Mummy, don't throw any piece of cardboard in the garbage). First mummy did not... she ignored it. She would still keep it beside the dustbin. So I told her you should not do it, so she said "ok, ok". Then after the second warning she also helped me to segregate it. I kept it in my veranda, and brought them to school." (NM)

Students' urge to try out some of the farming activities at their homes led parents to take more interest, and support their child in pursuing this interest. Some parents helped students compost at home. Some saved cardboards, bottles and other materials that could be used on the farm, instead of disposing of them. Others maintained an active interest in the

development of the farm, even if they were not able to help directly. The location of the terrace farm, open to public view from other high-rise apartments around the school, provided visual feedback to spectators, who could see different events unfolding at the farm. For instance, one student described how his father was observing the farm regularly:

"I can see the farm from my house, so have showed it to my dad. We even zoom in through the camera and take pictures of the farm sometimes... Now, I water the plants at home everyday because I want to see them grow like they are growing here..." (DV)

Such interest on behalf of elders also seems to have nurtured an active sense of ownership and participation from the students. Some students also secured small spaces around the residential societies to start a community garden, and found support from individuals who were already interested in such activities. One student shared her plans of starting a small garden in her own residence area,

"*So, we were able to get permission from the chairman of our building and we chose a spot. I was so happy to see that, you know, even the youngest of the kids, who go to nursery, are coming and picking up small lumps of mud and putting it. I was very happy. I will be very very determined to actually make a good garden of the one in our society, because I will kind of miss all the weekends we spent here. " (AM)*

It was especially interesting to note that senior citizens, who usually have had prior experience of growing plants, were eager to help the students in various activities. Such

instances also helped in community building, as students' expanded their 'action space', which became shared among other disparate individuals (such as older people) having similar interests. This overlap seemed to have motivated the seniors to explore more activities in this space. For instance, a student remarked,

"Earlier when my grandmother used to mention it (gardening)*, it wasn't a topic of much interest to me because I did not know anything about it. So I used to just avoid this topic. But now that I have seen so much happening and it is so exciting, so I have started to help my grandmother out. In fact, when I told her about all this* (terrace farming)*, then she got hyped means totally hyped. On the same day, she did not tell me, she went to the nursery, bought a few saplings, seeds, pots, mud everything and she brought it home. Now, we are growing a lot of stuff." (AN)*

These anecdotes illustrate how meaningful and embodied encounters with nature, based on participation, can contribute to students' actions in contexts away from the farm site, as well as involve community members.

7.5.5 Broader Perspectives

The activities on the farm were gradually reflected in more general thoughts students had on the environment, many of them taking shape through direct engagements or discussions on the farm.For many students, the idea of recycling took on a new meaning, as they began to look for other materials which could be used as planters. On the other hand, sorting plastic from the compost led to many discussions regarding the amount of plastic in the

environment, and they began questioning its use in packaging, along with alternatives. Usage of dried leaves on the farm sensitized students about the usage of dried biomass in their vicinity, and they made efforts to collect the biomass. Here, a student describes her growing interest in recycling:

"Actually I started recycling more because I started caring actually about the environment and the plants that I have planted. And my society as well, we had introduced a scheme that each member or each family would plant one sort of sapling or tree in the garden. So, that as well we carried out." (RC)

Others made connections with transportation of food, waste-disposal, and how urban-farming could address the issue,

"We can use each and every part of our location from ground to terrace ... and it is very advantageous because the plants are providing oxygen, the transportation of vegetables is saved, petrol is saved, and we are even making soil from dried leaves instead of throwing them in dumping grounds..." (KN)

"I mean most of the waste that is degradeable and organic waste… so the waste production would be very less… we can tell people that they can use the organic waste in the terrace garden itself. They would also be more cautious and won't produce much waste also. Like when we dump it in the landfill, we think it is just waste and don't care... but when they themselves would see that it is affecting their plants... in a good way... they would care. And

not just organic waste, like even the non-degradeable waste like plastic and bottles... they could use..." (RN)

Many students found themselves empathizing with farmers, as their respect for manual labour and food grew in the process of working at the farm. Remarks from a few students illustrate the point:

"I think farmers have a very tough job. We are just planting on the terrace, but they are planting on the whole field. They work in the sun, afternoon, early morning. They have to protect the field also. In our case, it is very safe and comfortable. We should really respect the farmers, because they are feeding us..." (AY)

"they (farmers) have to work a lot. Whatever we eat is what we get from them, We are making a small farm but they do cropping on a large scale, so it must be more difficult for them. Now when we see a plant infected we feel so bad. So if they have a large population of plants being infected, it must be a loss for them at a greater scale, so we think about that also..." (SM)

Their engagement with composting, and adding cow-dung slurry and mulch to soil helped them appreciate the richness of soil as an entity. For example, a student remarked:

"Earlier we thought soil is just something we get in packets and plants will directly grow in it. But now, we are realizing that it needs cow-dung, dry leaves, and many

decomposition materials that improves the nutrients. This has really changed what I thought about soil." (DV)

7.6 Parents' perspectives

To validate the responses of students regarding the activities at home, parents' (Ten respondents) viewpoints regarding their children's involvement on the farm, as well as their own initiatives if any, were sought[4]. Most parents came to know about the terrace farming initiatives through their children. They felt that the children were visibly excited about the project, and they used to explain to the parents whatever was happening at the farm in vivid detail. The following anecdotes describe what parents heard from their children:

"*He often tells me things he did as it's* (terrace farm) *his favorite topic now. My son and his friends had made some shelter for their plants and he did not stop talking about it.*" *(SSM)*

"My child would speak about the farm very often at home. I think she was really excited to describe how they made manure using cow-dung, cow-urine, jaggery etc." (RDM)

"Very often she would get some vegetables grown at the terrace like brinjal, chillies, spinach and ajwain. She was quite excited about it." (MHM)

[4] I visited the school on a few parent-teacher meetings for the assigned grade (VIII), where some parents (they were not accompanied by their children) visited the terrace farm, and I had some informal conversations with them. These were spontaneous in nature (conversations ranged from 15-25 min). It was difficult to arrange for visits to their respective homes, given their work schedule etc, so I requested their permission to send them interview questions over email (google form), and most them later replied over mail. In the end, I could visit one of the parents' who lived quite close to school and had been volunteering occasionally.

"She wasn't too interested initially, but one day she came and told me how she loved the smell of lemongrass. After that, she took more interest in the gardening activities..." (LKM)

Most of them felt that their children seemed to take more interest in their natural surroundings in different ways. For instance, many started growing a few plants at home,

"He wants to be with plants all the time.. We already have few plants at home and now he is keen to shift them all in new house. We are planning to make small vertical ladder-type planters in our new home to support his passion..." (KNM)

"She tried growing Lemongrass, Tulsi, and Fenugreek... She is very keen to grow more plants." (YSM)

Others mentioned seeing more tangential, positive outcomes,

"My daughter actually saw the process of growing vegetables. She understood the effort involved and does not waste her food now." (RJM)

"He has become keen on using wet waste to make manure. We save all greens, wastage in a bag for him. He also regularly waters the plants himself, and does that mulching he learnt in school..." (NMM)

Some parents mentioned restrictions in the multi-storeyed residential societies as a deterrent

for growing plants in their balcony. However, a majority felt inclined to support their children, and felt the activity as being a good way to bond with each other,

"I am planning to take initative to start terrace gardening in our own building terrace. I have joined pinterest (an image sharing social media platform) *to know more about planting" (KNM)*

"I was curious so I started helping her out. I also planted Tulsi and Kadipatta." (RDM)

"He wants to know more so he discusses with his grandparents about natural fertilizers and other things to grow plants better" (SSM)

Parents were invited by the school to see the farm on the day of Parent-Teacher meetings, and they were given the option to volunteer their time. A few of them began coming occasionally to the farm, and one parent (Usha), who had prior interest in composting found the opportunity very useful. In her words:
"I had started doing vermicomposting and had my first bag of compost ready when I heard about the project in the school. I had just quit my job and had time... so I thought it would be a good place for me to go and learn what I can do with the compost..."

She felt she had learnt many new skills and knowledge on the farm, and was eager to start something similar within her own residential society. She encouraged many residents in her apartment complex to visit the school farm. She mentioned feeling especially drawn to the

school farm through the enthusiasm of the students:

"I really enjoy seeing the children work. You can see it... they are so excited! They will run up to see what happened to the plant they sowed last week. It is just fun working with them... I mean I enjoy seeing the plants too, but seeing them is a bonus...! Even the mischevious kids want to take part..."

She felt that she had started paying much more attention to the soil and plants after working at the farm:

"I liked plants, but never paid much attention to what is happening to the soil, or how it is growing. Now, I feel it is constant interaction... Like, I feel the soil to see if its moist, has the level of the soil gone down, the insects in it... There is so much going on! I learn something new everytime I go to the school"

Over a period of time, she has tried to explore growing more varieties of fruiting and flowering plants, and often brings saplings to school. Her actions have encouraged more adults to visit the farm, and more people are interested in becoming volunteers.

7.7 Out-of-School interventions

In an effort to help students further understand the significance of their efforts in a larger context, two additional activities were conducted. One was an exchange visit with another school involved in terrace farming. The other activity was a field visit to a farm run by an urban entrepreneur. Details of the visits are given below. The responses of the students

indicated that they were highly engaged in these outings, and were observed to make a number of connections with their own activities at the terrace farm.

7.7.1 School exchange visit

Students participated in a one-day exchange event with another school (OLPS) involved in farming. I came to know about the school through a newspaper article[5], and subsequently got in touch with the facilitator at OLPS, who was running an NGO dealing with up-cycling of waste. She had started the project at OLPS as a composting initiative, which eventually turned into a gardening project. We thought it would be interesting for students from both schools to interact with each other. So, I spoke to teachers and principal at my school, who were quite enthusiastic regarding the idea of an exchange visit. When students were told that they would be visiting another school doing terrace gardening, they were quite curious to know more about it. Questions and comments ranged from "*What are they growing*?" "*Is it better than ours*?", "*Are they using cardboard*?", "*Did they start before us*?", "*We should decorate the farm before they come*" and so on.

On the given day, it was decided that students would first visit OLPS and see their farm, following which 40 OLPS students would come over to see the school farm, with each side acting as host respectively.

At the farm

Students immediately began exploring the OLPS farm along with their hosts (OLPS students) without any prompting from the teachers. The students were actively trying to draw

5 'Mumbai Students turn terrace into a farm, harvest veggies, fruits and herbs'. As accessed from https://www.hindustantimes.com/mumbai-news/mumbai-students-turn-terrace-into-farm-harvest-veggies-fruits-and-herbs/story-tFnZqKL5pyv9ITZXuUoT0M.html (published on 6 Feb 2017; Most recently accessed on 26 June 2020)

comparisons, at times making critical observations and questioning their hosts. It was interesting to note the boys being more critical in their questions than the girls, who were more appreciative and tended to point out things they liked about the OLPS farm. It is difficult to point reasons for the same, since multiple factors could be contributing to this behaviour. OLPS is a boys' school, so perhaps the male students felt a closer peer connection (which can be competitive), while the girls experienced the situation differently. However, it seemed that most of them were interacting closely with the farm and other students through questions such as "*How do often do you work here*?", "*What all are you growing*?", "*Why have placed the planters there*?", "*What is this* (scarecrow) *for*?" along with a number of other specific questions about the plants themselves. The OLPS students mentioned that they faced regular raids from monkeys, and their stories elicited a lot of sympathy on the part of the school students. They could empathize with their losses and frustration, and were keen to know how they were dealing with the problem. Later, the OLPS students visited the school farm, and were enthusiastically shown around by the students. They were keen to explain their efforts, and the methods they had used to grow the fruits and vegetables on the farm. The exchange visit ended with a larger sharing session, where teachers and students reflected on what they observed and liked about the visit. Some seeds were exchanged to symbolize a peer-network and students said that they would like to meet each year to find out more about each others' farm. This entire exercise developed in an organic fashion, and students were motivated with the idea of having peers across different schools.

Figure 7.6: Snapshots of students interacting with each other

7.7.2 Farm visit

Students were taken to an organic farm situated at the outskirts of the city, to help them situate the terrace farm in the context of farming activities done on larger tracts of land. This farm belongs to an entrepreneur (SB) in his mid-fifties.

SB owns about 45 acres of land, of which 25 acres is farmed in the form of a food forest. The rest is left fallow as grasslands for cattle grazing. Although a businessman by profession, he maintains that his heart lies in tending to the land, and he has been doing so every weekend for the past 30 years. He attributes his love for nature to his experiences of being part of a wildlife club as a student at the Indian Institute of Technology (IIT):

"*So during my IIT days, I used to be heavily into these nature activities. I was the secretary of wildlife club and it was a very well funded activity. And during that time, I was concentrating more on this than on my career. During the five years of my engineering, we ended up visiting about 22 national parks, sanctuaries and tiger reserves all over India, right from Kashmir to Kanyakumari and Gujarat to Kaziranga. It was such a joyful activity that at the end of the day I decided that I would do something to return back to nature and not as a*

matter of environmentalist whether I will go and protest against the building of a dam...it may be a small project or it may be whatever project, here is something that we will contribute to nature, not as a commercial activity..."

Figure 7.7: (Left) One of the rainwater recharged ponds on the farm; (Right) Teak trees allowed to reforest a patch of the farm

His father bought the land in 1986 for a pittance because it was a completely degraded, barren patch of land apart from a few teak trees. After buying the land, SB spent the initial years in just allowing the natural biomass to grow and slowly replenish the soil. Later, he bought a few native variety cows to make manure and liquid fertilizers using cow-dung and urine. He doesn't milk these cows, so the calves get all the milk from the mother and are usually quite healthy. He believes in 'giving back' to nature as an essential part of his practice of tending to the farm. This is evident in his policy to leave the leaf litter from trees (rather than clearing them), allowing for humus to form, and making rain water catchment areas to replenish the groundwater. He doesn't use any chemical fertilizers or pesticides, and is mindful of the evolving food ecosystem at the farm.

"*And what you see there, you know this is a dragonfly right. Ya, this is one of the best friends of humans, because it is one of the predator insects. Wherever you have dragonflies, you can be sure that there will be much less infestation. And at night if you come, we will have lot of fireflies, those are also predator insects."*

"This particular tree…this is leaf litter, we are not doing anything to this leaf litter neither are we doing anything to this tree. We are not giving it any fertiliser, no water nothing. But this is a nicely grown Teak specimen, healthy. And this is where sustainability comes as in the case of a forest. If we do not interfere, nature just allows it to grow and grow and grow. Now if you see below this, it is all humus. This is all growing nicely. And at the end of the monsoon, most of this would have turned into soil."

Students' visit

Students were excited at the prospect of a field trip, and began to explore the surroundings once they reached the farm. They saw the forest litter and asked questions such as, "*Isn't this like Amrut Mitti*?", "*What do the cows eat*?", "*How much dung do you use*?", "*How did you start*?" and so on. They made a number of observations, which seemed to be based on their experience of terrace farming. For instance, when they were shown around the teak plantation, few seemed to wonder that if the teak trees were so closely spaced, wouldn't there be competition for nutrients, soil resources? Some of them intently observed the different fungi that grew on the barks of the trees and were also trying to distinguish the types of fungi on the basis of texture. On the forest floor, when they spotted small crabs, few students followed the trails of the crabs, with excitement. They were quite interested to observe the

different kinds of insects on the leaves. Their questions indicated that some of them were also thinking of human dependencies from a sustainability point of view. To illustrate, when the students learnt that the cattle were not used for milking purposes, few started to wonder as to how the basic needs of the people on the farm were being fulfilled. There were questions like, "*Did they have to depend on the market to buy the products?*".

Many students found SB's background as an engineer from a reputed institute, and his passion for farming as a serious role model, something to think about. One of the students remarked, "*So like him (*pointing to SB*) I can work and do farming too! Not just in balcony but actual land!*". Others wanted to implement some of his practices at the school terrace farm as well. A few students, for instance, asked the teachers to help them design a rainwater storage system and a small pool on the terrace for frogs and fish. While the feasibility is another issue, such discussions indicate that students were highly engaged and motivated to build on their experience of farming through their interactions with SB. These interactions reaffirmed students' involvement in farming activities, and learning about SB's life choices seemed to legitimise the practice beyond an extra-curricular activity.

Figure 7.8: (Left) SB explains the activities on the farm; (Right) Students enjoy a view of the surrounding hills from the edge of the farm

The research on Significant Life Experiences (SLE) pioneered by Chawla (1999), emphasizes the role of formative experiences in shaping people's involvement and commitment towards the environment. While a number of empirical studies have investigated adults sharing experiences of the past (Palmer et al, 1998; Payne, 1999; Hsu, 2009), there are relatively few studies investigating the role and process of formative experiences in a younger population (Arnold, Cohen & Warner, 2009). Interactions with role models may have an important contribution in shaping students' perspectives, especially when they are involved in a similar practice.

7.8 Summary of the observations made as part of the case-study

This case study of the school terrace farm indicates that students gradually developed an attachment to the farming practices and space, and extended their actions to the immediate community. The following salient points emerged from this study:

I) Somaesthetic interactions seem to play an important role in sensitizing students to different

aspects of plant care, as they are able to attend to their surroundings in more intimate ways.

II) Moments of 'enchantment' can emerge in unconstrained and undirected exploration of the site. These are unique, affective episodes that can act as precursors for a more caring attitude towards the surroundings.

III) Feelings of novelty, challenge, and a perceived sense of purpose can act as motivational triggers to enable students to feel more responsible towards the farm site.

IV) Feedback, in the form of the evolving terrace farm, growth of plants, and harvest, motivate students to remain invested in their efforts. Additionally, social feedback from peers and teachers contribute to their evolving identities as people who 'care for their environment'.

V) Students' experiences on the farm facilitate larger connections, such as the effort taken by farmers to grow food, the biomass that can be composted instead of being burnt or sent to landfill, bio-diversity and pest-predator relationships, etc. These are mediated by their participation in different farming activities, such as making compost, plant-care, seed-saving and so on.

VI) The activity has the potential to connect community members in diverse ways. Parents seem to share an interesting dynamic with the students, wherein the former are being 'taught' a few activities by the students. The older generation, on the other hand, seem to be enthusiastic to share their experiences of farming with the students.

VII) Interactions with an extended community of peers and role-models can act as formative experiences, to shape students' perceptions regarding the significance of their work, and also motivate further actions, in a sustained manner.

Chapter 8 Extending the enactive account of motivation

Full-bodied experiences are an essential dimension of forming affective, meaningful relationships with the environment, and the extension of the care-based actions that emerge from these experiences, to the larger community

"For it is only at the scale of our direct, sensory interactions with the land around us that we can appropriately notice and respond to the immediate needs of the living world" —David Abram (1996)

In this Chapter

Somaesthetic experiences and instances of 'enchantment' are argued to form the basis for care-based interactions with the plants. Students extend their farming-related activities into neighbouring communities, partly based on the increased affordances of artefacts that emerge from these experiences. Further, the possibilities of teaching/sharing these actions in the form of group activities act as a form of social motivation. These findings extend the account of motivation presented in chapter 6, to include trajectories of larger participation (away from the original site of practice).

8.1 Discussion

The design of the school terrace farm was informed by findings from the case-study of the community urban-farm, which highlighted the role of 'performative' entities and 'coagulative' practices, in motivating the adult volunteers to grow plants and participate in diverse environmental actions related to farming. Similar episodes were observed among students,

where embodied experiences through interactions with performative substances such as compost, *amrut-jal,* seedsetc. expanded the action possibilities of students, in relation to various artefacts in their environment. For instance, a discarded pile of cardboard boxes were seen as potential planters, or heaps of leaves would be seen as a precious resource for compost and mulch. Students' evolving narratives towards the immediate farm environment thus provided them with a new stance, which acted as a lens through which they subsequently observed their neighbourhood. Acting on these observations reinforced their perceived skill and knowledge of farming related practices.

Students also reported initiating various activities at their residential areas, often involving the parents and grandparents as co-participants. Based on these findings, I propose that multi-modal sensory experiences, and the possibility of sharing these with other individuals, motivate children to expand their sphere of activities into neighbouring areas. More broadly, somaesthetic interactions (discussed in section 8.1.2) and shared actions (discussed in section 8.1.3) provide additional dimensions for extending the previously discussed model of motivation (shown below, figure 8.1).

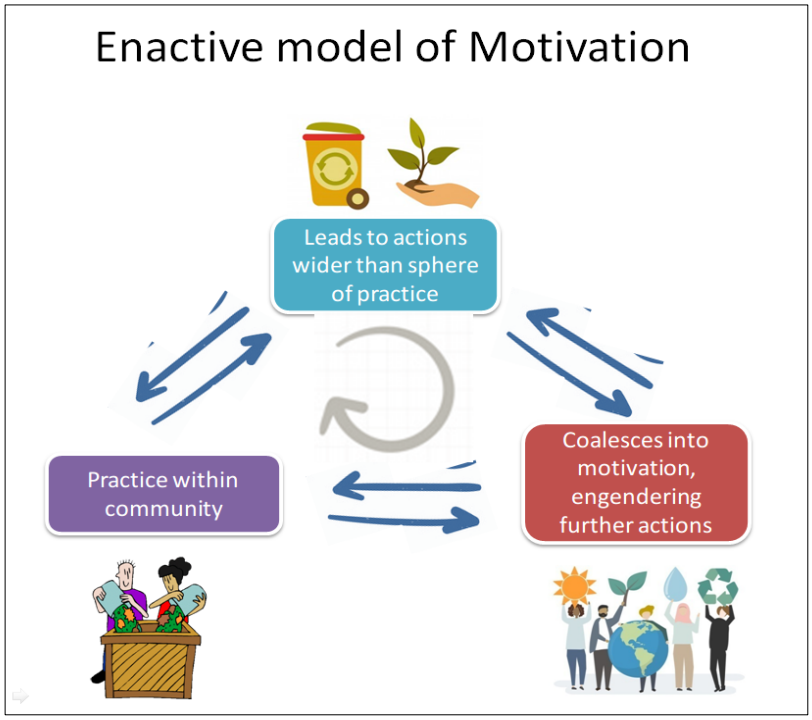

Figure 8.1: The enactive model of motivation as discussed in Chapter 6

8.1.1 Actions extending to neighbouring community sites

Students reported engaging in activities such as composting, mulching, growing plants and saving seeds in their residential areas. Such 'extension' of activities from the school terrace farm site was possible once students acquired the skill needed to act, as well as manifest environmental care and concern. Students' expanding action space was closely connected to their sense of meaning-making and personal fulfillment, as they were able to act on their newfound knowledge and acquired skills. Chawla (2008) makes a similar point by arguing that individuals attain well-being when they have the opportunity, and the skill, to take effective action (in the context of the environment). In other words, students' actions at the

terrace farm also transformed and extended the *possibility* of actions in the extended environment. These action possibilities make the environment more meaningful, and contribute to the forming of different kinds of new relationships (Heft & Kyttä, 2006; Kyttä, 2006). For instance, entities in the environment assume newfound affordances[1], through the range of interactions at the school terrace farm. For instance, a pile of dry leaves, swept and kept aside at a roadside, now always reminds students of mulching and composting. Items in the kitchen (such as pulses, spices) transformed into seeds that could grow in the balcony. Kitchen waste could be converted into compost, and cardboard boxes reconfigured to make planters. Students reported taking saplings and seeds from the school farm to grow them in their residential spaces. Many of them also attempted to compost their wet waste or bring it to school in order to add to the compost pit. A few others tried to initiate a similar farming set-up in common spaces near their apartments. They commented on feeling more involved in re-use/re-cycling initiatives, and would think of novel ways to make planters better suited to their homes. The feedback received by the students in the form of encouragement or affirmation of their efforts by relatives or teachers further bolstered the sphere of actions away from the original site of practice (as shown in the figure 8.2 below).

[1] 'Affordance' is a term originating in Gibson's (1979) writings in ecological psychology. An affordance describes a property of the given environment with reference to functional possibilities of an individual. It thus refers to a relational property, depending on both the environment, and the individual.

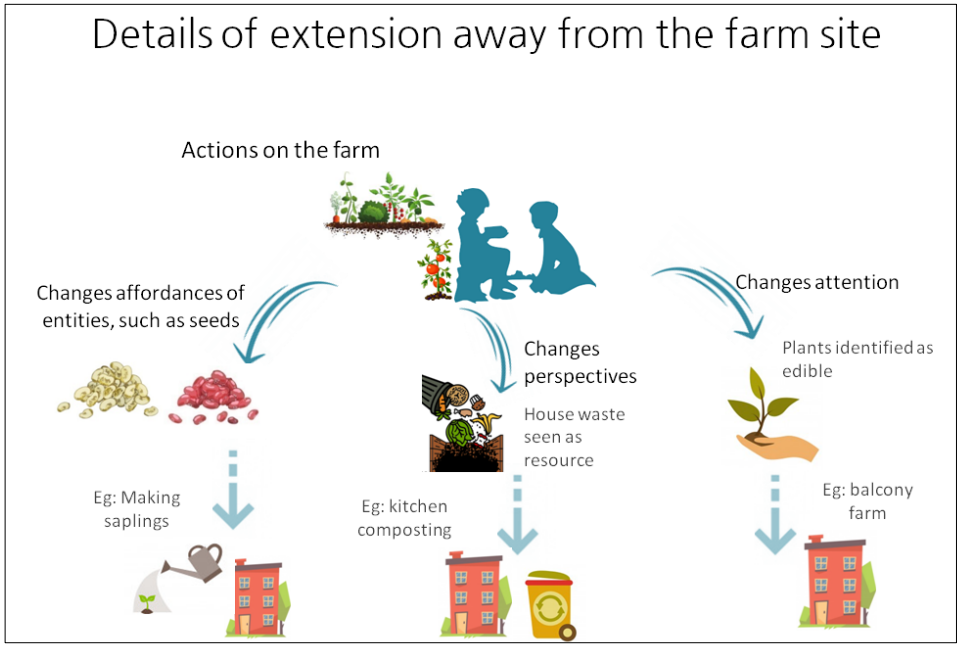

Figure 8.2: Students move into activities away from site, through the expanded action-space and affordances generated by activities in the farm

8.1.2 Somaesthetic experiences as leading to care-based interactions

Sensory participation was central to students' experience of the terrace farm. The visceral sensations of tasting the plants, digging the soil, stroking the leaves, gingerly handling the seedlings, feeling the movement of insects on their fingers, hearing the buzz of bees, smelling the composted soil, and countless other encounters, particularly in relation to the growing of plants, 'invited' students to participate in an evolving, reciprocative relationship with the farm environment. Engaging in different modalities of perception (as opposed to a dominant visual mode) facilitated what Abrams (2012) described as a shift from description 'about' to correspondence 'with'; i.e, students were *responding* to the plants rather than *studying* it. Iared et al. (2016) argue that “close contact with the unpremeditated sensible

world awakens in us biophilic feelings, precisely because we have a common origin with the elements of nature" (p. 194).

At the farm, the plants were not objects of scrutiny, rather through their growth and other changes, the plants became active participants in expanding students' relationship with their surroundings. This expansion in turn allowed students to attend to wider experiences, and develop greater sensitivity towards the farm space. Termed here as moments of 'enchantment' (Bennet, 2010), students' heightened awareness towards the farm activities allowed the usually ignored 'background' to present itself in novel, wonder-inspiring ways. For instance, once aware of the millipedes in the soil, students could see them everywhere, journeying through perilous spaces between soil planters. Observing their routes led students to notice the slime trail of snails and slugs which could be hiding under the flap of a cardboard box. They would lift the damp flap to see it dotted with tiny fungal structures... but, hold on, the fungi almost seem like flag posts for the hordes of ants passing the cardboard flap! Follow their trail back into the soil where the millipedes were first seen... one can see the 'worlds' students could have traversed through their sensory receptivity of the surroundings. Bennet (2010) comments that "To be enchanted is to be struck and shaken by the extraordinary that lives amid the familiar and the everyday" (p.4). These experiences suspend control and predictability, in order to make space for awe and fascination. Bennet further argues that valuing such moments "enhances the prospect of ethical engagement" (p.13). Sewell (1995) contends that "skillful ways of seeing" offer direct routes to developing ecological sensitivity and action. Various episodes at the farm indicated students' increasing sensitivity towards the creatures and plants on the farm. They would rescue the 'wayward' millipedes straying too far from the soil, concerned that they might die in the heat or become

prey for the crows. They would fuss around endlessly around plants that were afflicted with pests. Barren soil would be carefully covered with mulch to keep the soil “happy and moist”.

Honing one's attention towards such particular aspects of the environment generated instances of 'response-ability' (Haraway, 1997; Kayumova, McGuire &Cardello, 2019), wherein individuals could respond to, and partake in, a shared sense of well-being. Their attribution of emotional states to the creatures and plants could be argued as ways of empathizing with these living beings as responsive and deserving of care. Postma (2012) argues for the centrality of a care-based relationship in engendering environmental sensibilities, stating that these can't be derived from abstract principles of responsibility or justice. He writes, “In our caring, we express a recognition of something that fulfils us in a particular way, and invites the response: ‘When the other’s reality becomes a possibility for me, I care’ (Noddings, 1984, p. 14)” (p.309).

Bai (2009) describes the intimate, embodied relationships as a process of 'animating' the world, thereby building reciprocity and respect into relationships (as opposed to transactional interactions). Interdependence is implicitly felt by the students, as they harvest the fruits of the plant they sowed themselves a few months ago. As Ingold (2006) writes, “it (animacy) is the dynamic, transformative potential of the entire field of relations within which beings of all kinds, more or less person-like or thing-like, continually and reciprocally bring one another into existence” (p.10). In developing affective tendencies for the space, the overall narrative towards the place shifts as well (from 'the school terrace' to 'our farm'), further motivating students to enact their care in multiple ways. The diagram below (figure 8.3) illustrates the trajectory of such evolving relationships.

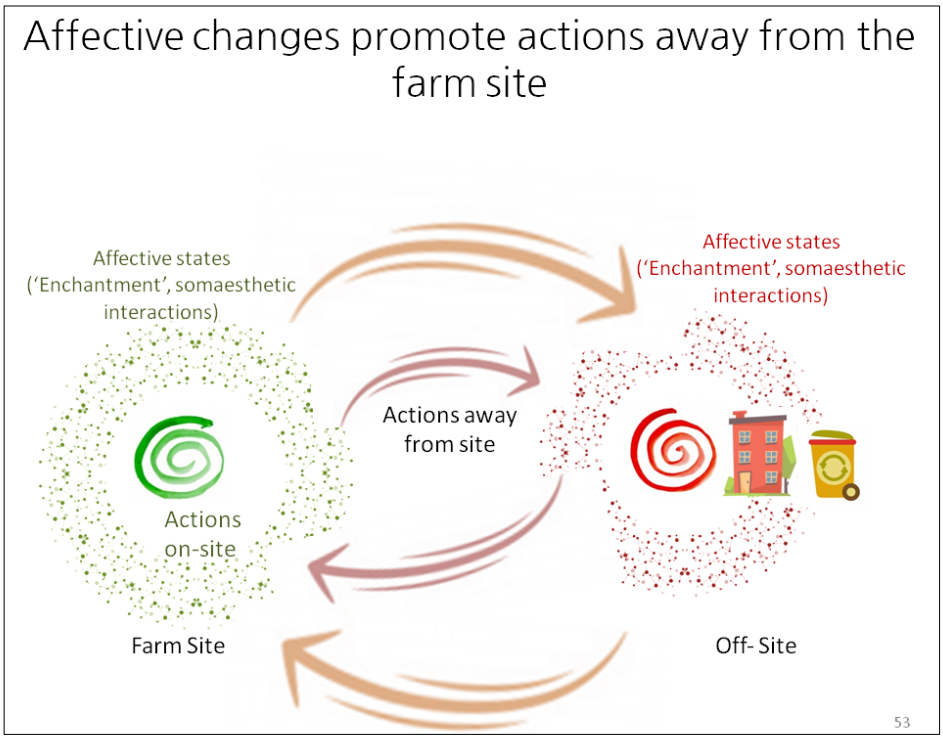

Figure 8.3: Processes involved in students' interactions with the plants. Initial experience with plants, act as a ratchet to enhance sensory interactions, which attune students to changes and phenomena otherwise ignored (such as flowering, tendrils etc). Termed instances of 'enchantment', these episodes potentially facilitate emotional responses that lead to more care-based actions towards the plant, as well as motivate actions away from the farm-site. This generates a positive feedback loop, where actions off-site strengthen the emotional valency of episodes at the school farm.

8.1.3 Inter-generational involvement in farming-related actions

Students' involvement in activities at their homes also led to the participation of elders, ranging from passive support to active collaboration. The older generation took an active interest in farming actions, according to the students. This could be attributed to their memories of growing edible plants (a fairly common practice earlier), thereby allowing them to share their experiences with the grand-children. The parents mostly did not have prior experience of farming, and are thus treated as 'novices' by the students. The opportunity to subvert the conventional mode of knowledge/ skill transfer (from parent to child) was a

motivational drive for the students. Many of them reported feeling 'proud' or 'happy' to share their knowledge and skill of growing plants with their parents. The parents in turn responded to their children's growing interests and activities. In some cases, the passive support transformed into more pro-active measures on students' behalf, such as facilitating donation drives to collect cardboard box planters, or volunteering at the school farm during free time. The following diagram describes how such community interactions are encouraged by students' farm experiences, which in turn further strengthen affective states (through somaesthetic encounters and moments of 'enchantment')

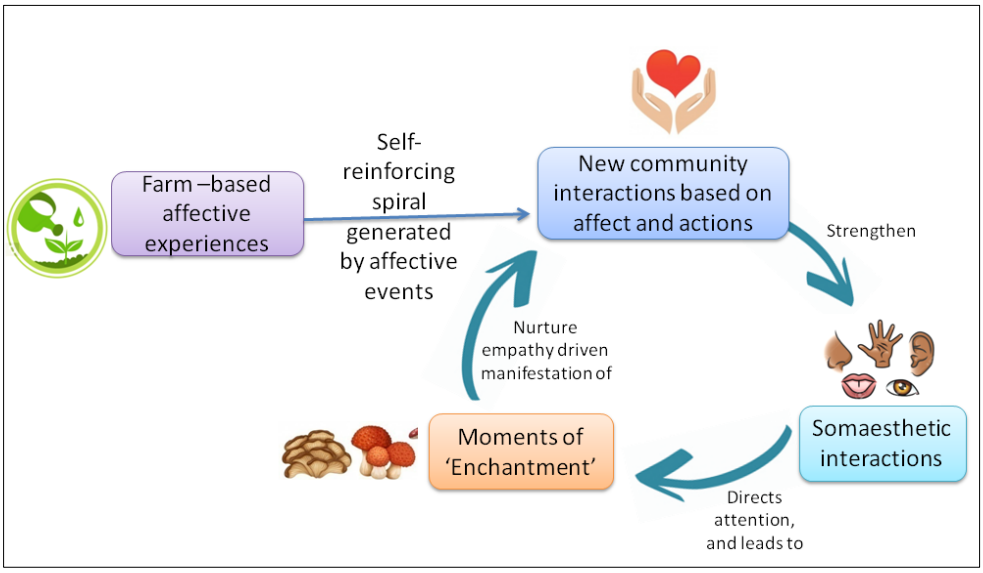

Figure 8.4: Integrating the above findings: Farm-based affective experiences, contribute to, and are enhanced by new community interactions

The importance of such inter-generational influence in promoting environmental actions has been argued by other scholars (Ballantyne, Connell & Fien, 1998; Kals et al, 1999; Grønhøj&Thøgersen, 2011) though the focus in these discussion have been the transmission of beliefs and behaviours from elders to children.

These instances of joint-actions[2] already have existing affective components (through family bonds and sensory interactions with the plant) that are reinforced through the participation in farming activities. Krueger (2010) describes such shared action-spaces as 'we-space'; an affectively-enriched co-ordinative space that involves dynamic interactions with social agents. These interactions are considered to form the basis for social cooperation, bonding and accomplishment of tasks involving a group (Fuchs and Jaegher, 2009; Candiotto, 2016). Marsh et al (2009) argue that "the presence of another person extends the action possibilities (''affordances'') that are possible for the individual. Just as a tool can extend our capabilities quantitatively (lift larger objects) so might becoming a social unit with another individual extend our action possibilities—qualitatively as well as quantitatively" (p. 326). Students' enthusiasm towards different farming activities seemed to 'pull' the adults into support activities such as storing cardboard boxes, making separate bins for organic waste etc., and gradually led the adults to take on more pro-active roles such as doing gardening themselves. The following diagram illustrates how students' expanded action space, and heightened affective states lead to the larger community getting involved.

[2] Joint action can be termed as 'any form of social interaction whereby two or more individuals coordinate their actions in space and time, to bring about a change in the environment' (Sebanz, Bekkering, &Knoblich, 2006: 70; Butterfill, 2012).

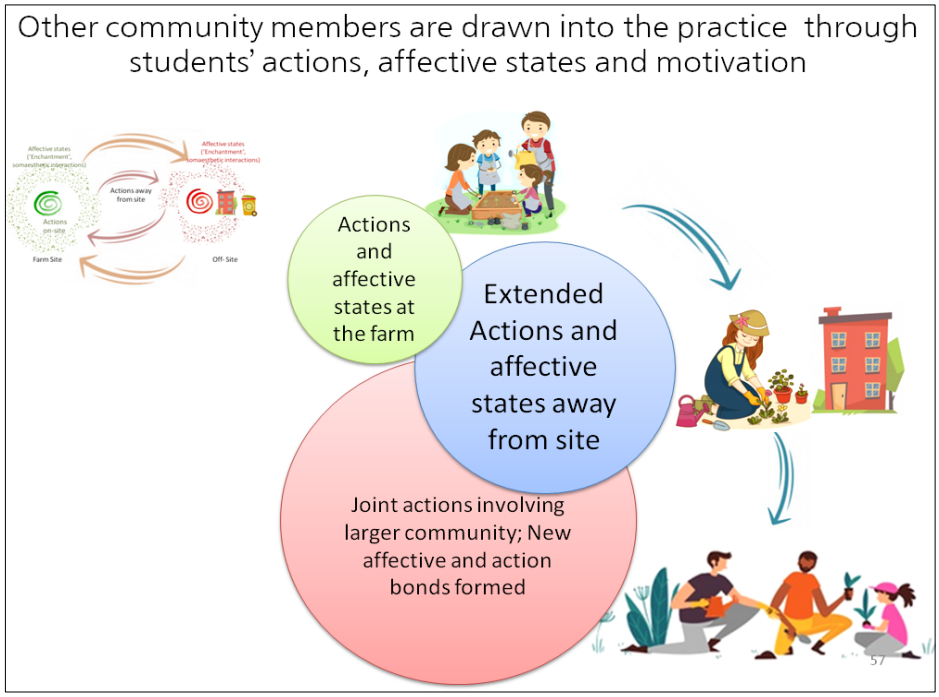

Figure 8.5: A proposed 'field model of motivation' that expands through shared actions and the resulting extended scope of activities. Students' interactions with plants on the farm create an expanded action space as well as opportunities to engage in shared actions with family (such plant care, composting, seed saving, collecting biomass etc). Shared actions in turn, allow for social bonding and act as an added motivation to participate in various activities

Interestingly, the embodied experience of the student is strengthened by the relationships with others. Székelya and Michael (2018) describe an empirical study to demonstrate that the perception of a partner's effort elicits a sense of commitment, and leads to persistence in the joint-action. Based on such studies of joint action, I propose that these shared activities allow for social bonding, which in itself acts as a motivation to participate in similar activities. As described earlier, students reported spending more time with their grandparents to explore gardening activities, while grandparents in turn took initiatives to help the children. More generally, dynamic and participative interactions between students

and elders lead to similar motivations manifesting amongst the adults. This aspect of social motivation, as a distinct parameter contributing to joint-actions, has been discussed by researchers in recent years (Godman, 2013; Godman, Nagatsu, & Salmela, 2014).

From another vantage point, Clayton (2003) argues that shared activities with 'significant' others contribute to integration of those experiences into one's conception of identity, though mechanistic explanations and empirical studies are scarce in this domain. Further research based on the lens of embodied cognition, on the role of actions and social motivation in the evolution of community norms, as well as in the emergence of collective identity in the context of environmental practices, would be useful in designing community-based interventions with better impact. The following diagram illustrates the role of affective dimensions in the model of motivation explained earlier.

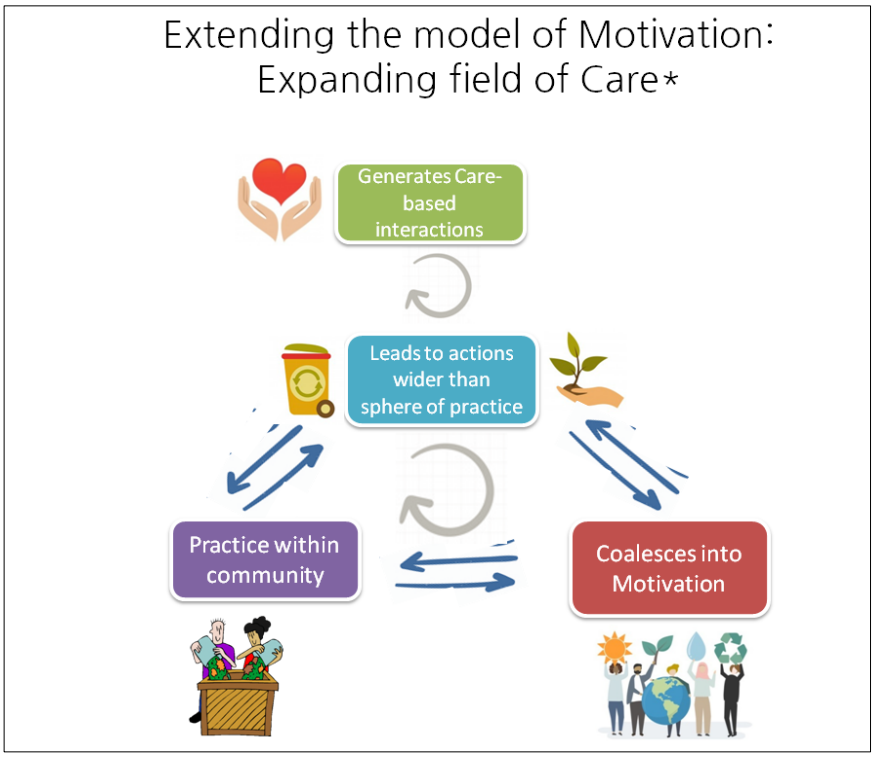

Fig 8.6: A revised model of motivation focussing on sense of 'care' as feeding into actions that expand the sphere of practice (of attending to plants, in this case)

Chapter 9 Teachers' perspectives

"Environmental educators have a degree of 'epistemic responsibility' and accountability. Not just any story or the act of telling a story will do. But the intentional quest for ethical imaginings throughlived experiences retold in narratives—this offers environmental educators myriad possibilities." – Leesa Fawcett

In this chapter

The views and actions of teachers directly or indirectly involved in the farming activity are discussed, including their perceptions regarding students working at the farm, connected initiatives within the curriculum, and any personal efforts prompted by their involvement with the school terrace farm. The case of the teacher directly involved in the project is discussed in detail, in addition to brief descriptions of other teachers indirectly associated with the farm. Their narratives indicate the possibility of using the farm as a transformational space, helping restructure their own identity as well as pedagogical practices. Their experiences also highlight the boundaries created by disciplinary affiliations. In the absence of direct participation, conventional teaching practices seems to affect their use of the farming space, and meanings derived from it. These observations are discussed in the backdrop of challenges in facilitating environmentally-oriented teacher education in the Indian scenario.

9.1 Teacher preparation in EE: A field of dilemmas and challenges

EE is a complex, multidisciplinary field requiring a radical departure from narrow conceptions such as imparting environmental literacy, to include effective ways to move students to take up pro-environmental actions. Gruenewald (2004) argues that EE teachers should be able to help students build personal and social connections with the local

ecosystem where the school is located. However, as Feinstein and Kirchgasler (2015) note, EE teachers have little or no experience from their own formal or informal education to develop relevant interventions for student participation in environment-oriented practices. The excessive focus on content transfer also tends to sideline the significance of teachers' own attitude and relationship with the environment, especially in terms of its pedagogical role. Wals and Dillon (2015, foreword) contend that “sustainability, in a sense, can't be taught” (p.vi). It must be experienced. It is important to thus facilitate salient experiences for teachers themselves because it can foreground *how* (in contrast to 'what') teachers convey ideas regarding the environment, and its subsequent impact on students. Faria (2015) describes a study which found that students' environmental attitudes varied more when taught by different course instructors, compared to variation based on differing course content. She builds a case for understanding EE teachers' value positions as a significant factor in influencing students' knowledge and actions.

However, the focus of conventional teaching is still on aspects of environmental literacy, and following this, very few studies have investigated the role of teachers' lived experiences in their teaching practices. Additionally, despite the understanding of EE as a complex process comprising relationships ‘‘at all scales of living systems’’ (Williams & Brown 2013, p. 21), and thus requiring a variety of engagements, most EE discourse is couched within subjects in science. Rahm and Gorges (2018) comment that relegating sustainability to science teachers counters the call for embedding environment-related topics across the entire curriculum.

The Government of India directed the apex educational research body in the country, National Council for Educational Research and Training (NCERT), to implement an infusion approach to achieve objectives of EE throughout the entire curriculum (as described in

National Curricular Framework, 2005; See Chapter 1 for more details). Yet, as Shimray (2016) notes, the National Council of Teacher Education (NCTE) developed a framework in 2009 that didn't discuss EE in any serious measure. The marginalisation of the content results in a systemic neglect of issues pertaining to it. Shimray is blunt in her critique: "... even the recently brought out two-year B.Ed curriculum by NCTE does not discuss environmental education, except for mentioning EVS as a composite area of study at the primary stage that integrates science, social science and environmental education … It remains to be seen how this idea of environmental education will be deciphered and taken forward by the teacher educators and put into practice in the course" (p.205). She argues that similar tokenism and neglect extends to in-service teacher programs. In the absence of clarity on objectives, and lack of support to teachers to engage with environmental issues, it is difficult to understand the ways in which teachers make sense of environmental issues, and connect them to their professional or personal identity. These are thus open research questions, with almost no literature available, in the Indian scenario. These questions are important in order to understand the assumptions underlying EE, and focus on ‘‘root causes of unsustainability as part of the wider quest for morally defensible, ethical, and meaningful lives’’ (Wals 2016, p. 5). Meaningful engagement with students requires teachers to be reflexive regarding their own practices, and to situate their lives in the larger discourse around sustainability.

The school farming project provided an interesting contrast case to conventional EE interventions (which are based on information dissemination). I was thus interested in understanding how teachers situated themselves in relation to the farm, and what were the implications of this intervention for their teaching methods. Their responses provide some preliminary insight into how such practices can be integrated as part of teaching, in ways that

don't emphasize formal knowledge, but focus on direct experiences. The teachers' views also capture the constraints and difficulties they face when conceptualising and implementing practices such as farming within the curriculum. The following broad themes describe different teachers' thoughts and initiatives based on their experience of the school farm.

9.2 Teachers' perspectives at the school

Teachers involved in the terrace farming project were interviewed to understand their perceptions regarding students' participation, and their own initiatives, if any, based on their involvement with the terrace farm. Additionally, science teachers, who were not part of the farming activity formally, but interacted with the students in the class, were also interviewed to understand their observations of the students involved. A brief description of the teachers, followed by thematic analysis of their views, follows.

9.2.1 Teachers

Samiksha

Samiksha is in her late forties, with more than 20 years experience. She is mainly involved with primary school children, because she finds the rigidity and pressure of following the syllabi in higher classes very taxing. She feels that she has more freedom in conducting classes at lower levels, and values this immensely. Over the years, she mentioned feeling distinctly uncomfortable with the pressure students are subjected to, and found herself asking the Principal “what is the purpose of such education?”. Prior to the commencement of the terrace farming project, she almost quit her job, but was unable to do so because she feels quite attached to her students. She mentioned the commencement of the terrace farm being a

significant moment for her. In part, the activity brought back childhood memories of growing edible plants with her mother. The project rekindled her desire to start growing some edible plants at home. The other point of interest was just the experience of a green space in the school. She has been a part of the school nature club for many years now, and is usually responsible for arranging different activities such as trekking to nearby places, tree plantation drive, reusing discarded materials etc. for students of various ages. She felt that a prolonged activity such as growing a food garden was qualitatively different from other activities. She was herself an active participant at the terrace farm, and liked to encourage students, especially to handle soil, cow dung etc. through using it herself. Visiting the terrace daily slowly became an important part of her routine, even though the sessions were just held once a week. She enjoyed the time because it gave her the chance to observe the changes in plants more closely, and some "free time away from structured tasks". She reported feeling very distressed when the area started getting highly saline water supply for some period, and she saw the plants reacting adversely to it. This episode made her realise how attached she had become to the place, and wanted to ensure that it continues to grow. She felt that her perspective towards soil and plants changed since participating in the farm. While she had experimented with composting earlier, her experience at the terrace farm allowed her to make composting a regular practice at home. She also started growing food at home, and closely follows their growth. At school, she found a number of ways to turn the terrace into a pedagogical site for younger children, by allowing them to interact with the space in a varied manner, ranging from plant care, art, literature etc. She eventually wants to form a group that would extend to parents and ex-students, in order to make the space more accessible to the local community. She also made efforts to help the school gardener feel ownership for the space, rather than perceiving farm care as part of his routine duty. This was done by making

note of his observations, recognising and felicitating his work at school functions, and actively asking students to learn from him. She also participated in two workshops on natural farming with him, and secured funds and permission from the school for this. She felt that his enthusiastic participation, and increased ownership towards the farm space, was an additional source of motivation for her. She was able to connect to him as a peer, and would often exchange their learnings and observations. She commented on how such a relationship would have been impossible to develop within the routine school activities.

Jayanti

Jayanti is a primary school teacher, with more than 16 years experience. She is from Kerala, one of the first states to have an active environmental movement, as well as a major push towards organic farming (See Thottathil, 2012 for a detailed history). She had strong connections to her home in Kerala, and was thus happy to be a part of the terrace farming project in the school because it reminded her of home. She was part of the school nature club, and was responsible for designing different activities for children. She however spent limited time on the farm, mostly due to the activity clashing with other teaching requirements.

Malini

Malini majored in Chemistry, and teaches Science, grade VII to IX. She has been with the school for about 17 years. She has a good rapport with students, and mentioned that she encourages them to discuss topics freely in the classroom, though time and syllabus is a major constraint. She wasn't directly involved in the terrace farming project, but mentioned feeling connected to it through the students. She would also hear about the farm activities from Samiksha, with whom she shared a car ride every day. She reported feeling happy just

hearing Samiksha's enthusiastic descriptions, saying, "*She is so excited to reach school on those (*farming*) days. Her energy iscontagious!*" Eventually, she did a composting experiment with students to compare aerobic and anaerobic composting as part of a science project.

Seema

Seema is a young teacher, she joined the school about 3 years ago. She majored in Chemistry, and teaches students from grade VII to IX. She mentioned feeling ill-equipped to teach students topics in biology due to her inexperience with the subject. She found the farm an interesting exposure to students. Though she could visit the farm rarely, she commented it as being an interesting experience for her as well, because she had no previous experience in growing edible fruits and vegetables. She felt that the syllabus for higher classes was quite packed, and found it a challenge to complete even the textbook. Given her early stage in the teaching career, she felt it was risky to 'stray' away from the syllabus, and she did not feel confident of handling open-ended discussions around the farming activities.

9.3 Themes discussed

9.3.1 Perceptions about the students

All the teachers felt that the students enjoyed the time spent at the farm for various reasons. Samiksha observed students at close quarters while they were on the farm, and commented that many had gradually become quite fond of the activity,

"Some are really interested in working on the farm. They don't want to leave and are often late for the art class that takes place later... So, the art teacher gave students the option to draw at the farm itself. Now we have put up some drawings students made of the plants on the farm at the notice board of the school..."

She also observed students outgrow their initial apprehensions regarding handling of soil and insects, once they saw how the farm was growing through their efforts (see figure 9.1 and 9.2):

"I could see that many students were not really interested at first... They were little apprehensive about getting into soil and touching it, doing things. But later on, even I found that when we gave them cow urine to spray they did not mind even though it was stinking... They knew it was useful and they started using it, even when we started this attempt of making "Amrit Mitti", everybody was involved... so there is a vast change in their attitude... that is what I observed. They realised it is going to really help and it is fine to get their hands dirty... "

Jayanti felt that some particular activities were quite salient for the students, and such episodes could also be used as topics for further discussion within classes:

"When they got the soil , compost and they found so much plastic in that they started thinking about how plastic came in this place. And then their thinking process starts... every where there is plastic, who is throwing it, where does it go..."

She felt that the students also played an important role in introducing their parents to the

terrace farming project:

"Children are also going and talking to their parents. They bring their parents to see the terrace garden up and close when we have an open house. I have seen that some parents don't even know how a raw tomato looks like when it is growing on the plant! The students are actually showing them around..."

Samisksha thought that the exposure was useful in kindling some enthusiasm on the part of the parents:

"few parents when they came and saw the garden they were very enthusiastic about it. They were trying to figure out where they could start this this garden, because many buildings don't allow such gardens in balconies and terraces. Some of the buildings are making compost, vermiculture, vermicompost, they utilising it for their own plants... so some sort of community gardens can be built in such places"

Teachers such as Malini and Seema, who could not be at the farm, reported that students would often bring the day's harvest to the classroom to show it to everyone. For instance, Seema mentioned:

"They were so excited the day they had some tomatoes and cauliflower... I think they went to almost every class because they wanted to show it to everyone!"

Malini also felt that the ritual was of immense importance to them:

"You should see them when they bring the harvest. They are so proud of their work! It is like they are parents holding a baby!"

Malini commented how she could further her interactions with students through their sharing of experiences:

"On a regular basis they are telling me because I was not a part of actual activity... every time they would tell me what harvest did they get or what seeds did they sow. What are the layers in the compost heap and what they are expecting... so many things on a regular basis and I also ask them often."

9.3.2 Teachers' initiatives at school

Samiksha began taking younger children to the farm occasionally on her own initiative. She mentioned making use of various school engagements (such as Writing, Art-based events) as ways to introduce students to the terrace farm in some capacity. She felt that younger children enjoyed spending time at the farm because they were thrilled to observe so many insects and worms in the soil. She observed that younger children were more attracted to things that had perceivable movement, and the farm offered an interesting space for detailed observations.

"The first time, they were super-excited to go to the terrace because they know there is the school bell there! But, then they saw the farm and some butterflies around the plants. They are instantly attracted to sounds and movements you see... I asked them to just observe the plants. Later, I asked them if they would like to donate their banana peels to the farm, and they were so excited to be a part of it... I can't take them to the terrace everyday, but this is their connection. Getting banana peels everytime they eat a banana in school... The slightly older children get dried leaves from around their place... Then, with another class we made seedballs using seeds of native trees... this way they get connected to the project..."

Figure 9.1: (Left) Samiksha[1] helping students make supports for climbers; (Right) Introducing a teacher to the farm through harvesting some colocasia (*Allu*) leaves

She made use of window sills in her classroom to grow smaller plants such as *Moong*, Mustard etc so that children could observe the growth on a daily basis. She also encouraged students to ask their parents and grandparents about growing food so that personal stories could be shared in the class.

Taking a cue from Samiksha, Jayanti was also eager to design small activities that could connect students of classes not directly involved with work on the farm. Activities ranged from making saplings, seed balls, having a leaf collection drive, getting cardboard boxes from home and so on. She felt that students involved in this manner also felt attached

[1] Permission to use photos were taken from the school principal and teachers

to the project.

They also observed some interest among other teachers not involved in the project, through the occasional sharing of harvest. Jayanti commented:

"*Most of the teachers have visited the garden, and we often get the harvest to the floor so that all of them have an idea... we also distributed some of Ajwain and Lemon grass amongst teachers. Some of them took saplings to grow lemongrass in their home... Even principal ma'am asked us to help her learn composting...*"

Figure 9.2: Jayanti celebrating with students after a bumper tapioca harvest

She felt that the endorsement of the principal was especially helpful in getting support, as well as the resources required for the project. Malini found the farm to be a good resource for helping students understand concepts in Biology. She shared how students found it more interesting to observe the farm, rather than read abstract descriptions in the textbook:

"7th and 6th where I teach as well, they have similar lessons. Like plants, forms and functions and plant reproduction. So I took them to the farm for a couple of classes, I showed them around. I showed them tendrils, parallel venation, reticulate root, tap root, fibrous root.

What kind of fruits? How flower grows into fruit? What part of flower grows into fruit? What is sepal, what is a petal, everything... I could see their enthusiasm on their faces because they themselves observed tendrils, how they are coiling, what kind of support. For each plant also tendrils are different, because they are from the leaf. For pumpkins tendrils are different, for bitter gourd tendrils are different. Then shape of the leaves, different shapes and colour. Cabbage, cauliflower, they had never seen them growing as plants... It was such a novel experience for them that it will stay with them for a long time."

Seema felt that students were sharing their perspectives in the classroom based on the farm experience:

"For example there were these chapters on waste management and crop production, the different methods. Of Course, they did not do the farming as done in rural areas... But harvesting, how to sow, when to sow the seeds, what are the better options of the seasons. Like the other day they told me tomatoes will not grow because now it is summer. So they got little more knowledge about which crop to be harvested in which season. Better time to grow which crop. That was the additional knowledge. And some of the plants they can grow throughout the year. That also they got to know and told me about them."

Malini and Seema also did a composting experiment as part of a Science project, where they compared features of aerobic and anaerobic composting methods based on final bacterial count. They felt that students' experience in farming helped them generate genuine interest and curiosity in understanding the composting process as well as the differences in composting methods. Based on students' responses, they felt the need to develop more

connections between the curriculum and students' farming experiences.

9.3.3 Personal initiatives

Samiksha was the primary teacher involved in the project. She thus experienced a variety of activities on the farm for a sustained period of time. She felt that her interest in trying different methods to grow plants had increased substantially after participating in the farm activities in the school.

"*Making of rich soil and the way it works is something I am learning every day. I have been introduced to bio-culture, to earthworms, bees and other useful life process happening around us. Every year there are new ideas adding up to the experience. Even minute details, even from the gardener so many things about how and when things have to be planted and what have to be planted together to help them to grow better."*

Her initiatives also seemed to be motivated by pragmatic concerns about plant health, and allowed her to have an experiential understanding of the same.


Figure 9.3: (Left) Samiksha growing edibles in her home balcony; (Right) Her collection of leaves from the neighbourhood to make compost

"When I try it at home also I find it works. I learnt about Amrut Mitti which we also tried over here. So at home also I tried Amrut Jal and I have used it. So then it made a difference... I tried soaking vegetable and fruit peels in water and use it on the farm after diluting it. I have actually seen some difference in plants after applying it. You can also spray it. I also tried some diluted raw milk, buttermilk, and of course, cow-urine... I am not really sure how it works, but I see plants looking healthier..."

Samiksha began composting at home (figure 9.3), and also encouraged her neighbours to start composting. She also started growing many edible plants at home, and mentioned that her husband has also started taking a keen interest.

"During last one year I have been rearing earthworms and they seem to be thriving well. I am growing herbs like coriander, mint regularly. This year I have harvested plenty of

tomatoes. All those supports (pointing towards the trellises) *were made by my husband. He enjoys making them too, especially after seeing the fresh harvest! Spinach and red amaranths is a regular crop in my balcony that has access to partial sunlight."*

She reported paying a lot of attention to the direction of sunlight after starting to grow plants, and places her pots in different areas depending on the season. She also felt that she had begun noticing neighbourhood areas differently.

"I have started looking at dry leaves fallen on roadside in an absolutely different perspective... Not only leaves but at every biodegradable waste and wonder how each and every natural item can be reused and converted into rich soil."

She is keen to expand the school project to involve more teachers, and parents as well. She identifies herself as an 'urban farmer', and sees it as an important part of her role as a care-giver in a family.

"Whatever little that I am able to grow, it adds to a sense of satisfaction when I keep adding the homegrown micro greens to the food I cook for my family. In a way, I actually take my family's health in my own hands..."

She felt that the terrace farm has the potential to connect to the neighbouring communities through non-formal routes, and that those connections should be encouraged.

"The project needs to reach out to the community where people may contact us for help to

learn ways of creating rich soil. Our ex-students should feel like coming back to witness the place, years later. We need to conduct workshops and social outreach programs."

Other teachers mentioned composting at home, and talking to residents about composting. They didn't have space or opportunities to grow plants at their home, but were enthusiastic about volunteering at the school farm or other residential projects in the future. For instance, Malini commented:

"*So that* (terrace farm) *has changed my perception about growing plants and I have started doing it at my home also. The magic bucket* (Referring to a commercially available compost bin). *It is already done. The second bucket, it is on now. So actually it has really helped me to understand, because in cities what we feel that doing the kitchen gardening and all that is really not practical and not possible but it is not like that. If there is a will there is always a way. And that is how it can be worked out very efficiently.*"

They also brought leaves and cardboard boxes to school to help in the farming activities. After seeing local vegetables being grown at the school farm, they were also keen to try new recipes and expand their knowledge of edible plants.

9.4 What environmentally-responsible teaching might look like: Some reflections

The narratives indicate a variety of ways in which the terrace farm turned into a space of reflective engagement for the teachers, especially Samiksha, whose embodied experiences

shaped her personal and professional identity. The terrace became a site of active co-construction between the plants, children, her and the gardeners, together making the farm activity space. Formerly, as an out-of-bounds, locked-up space, the terrace was 'naturally' barren until farming activities gradually transformed the area. Gray and Colucci-Gray (2018) draw on some outdoor walking experiences of pre-service teachers to argue that significant changes in perspective are socio-spatially mediated. They write, “walking and physical engagements with the materiality of places can open up participants’ eyes to the qualities of their environment, challenging pre-existing categories as they come to ‘see’ things in a different way”(p.15). Samiksha's increased receptiveness towards observation and care of plants contributed to her pedagogical practices of designing similar experiences for students. These were her re-imagined moments of agency, since these practices did not follow from the prescribed syllabi. Instead, by embracing the realistic contexts of the uncertainty of weather, varying conditions for the growth of plants, water availability etc. she presented a more authentic and interconnected environment for students to explore.

On the other hand, the Science teachers also made use of the farm space, but in ways that aligned with their ideas of curricular goals. This could be attributed to their lack of sustained participation in the farming activities, which otherwise might have facilitated some shift in their teaching practices.

These observations provide yet another confirmation of the 'Artifact-Performance-Feedback-Coagulation' (APFC) model of motivation by illustrating how the *lack* of direct interaction with relevant artefacts (such as plants, compost, seeds etc) lead to failure in implementing new pedagogies. It also shows that teachers can be part of multiple APFC loops, and the extent of participation in different practices direct larger perspectives towards teaching in general.

The Science teachers' appreciation of the farm was qualitatively different from Samiksha's, since they saw it as a means to teach students “better science”, despite some pro-environmental actions taken in their personal space. They could not legitimise what Masschelein (2010) describes as “educating the gaze” as a pedagogical practice to foreground attention over awareness. In other words, simply attending to the farm through paying close attention to the plants, could not assume priority in their teaching narrative. Their way of prescribing importance to the farm already bore marks of categorisation and reduction of the plant-student relationship to that of common topics in the science textbooks.

Ingold (2018) is critical of this approach, as he writes:

> “ if education is about caring for the world we live in, and for its multiple human and non-human inhabitants, then it is not so much about understanding them as it is about restoring them to presence, so that we can attend and respond to what they have to say” (p.28).

In a similar vein, Kopnina et al (2018) argue that educators need to conceptualise and frame different ways of being, such that an ecocentric perspective (as opposed to utlitarian, anthropocentric approaches) can be nurtured in students. They term this 'rewilding' pedagogy, a compensatory narrative that can allow students to explore alternative perspectives towards nature. However, for teachers, especially at the middle or high-school level, such shifts in aims of teaching could amount to disciplinary transgressions. Thus, unless they are able to gain first-hand experience and grapple with the import of sustained activities such as farming, it is a fairly difficult task to integrate such practices into teaching in “transformative ways" (Mezirow & Taylor, 2009). Despite good intentions, there are fair chances of the activities getting appropriate and seen as instruments to help students gain

discursive knowledge about the environment. In a baseline study to understand Canadian teachers' perspective of EE, Nazir and Pedretti (2014) report that topics/ activities pertaining to the environment are treated marginally compared to other academic activities. Gaps existed between teachers' beliefs and practices in terms of their personal ideas regarding the environment and what was presented in the curriculum. Furthermore, they reported that teachers felt inadequately trained to deal with the complexities and open-ended nature of EE. These issues seem common to teachers' perspectives as shared in this study, though more research is needed to characterize problems that might be unique to the Indian context.

The perspectives shared by the teachers offer a glimpse into ways in which experiences such as farming might enable a shift in their practice, as well as the challenges that might discourage them from acting on their evolving ideas about the environment. Some of these challenges emanate from perceived disciplinary and practice boundaries, while others stem from inadequate experience of participation in sustained ecological practices (such as farming). Given the urgent task of EE in enabling impactful environmental actions in local communities, it is important for teacher educators to deeply engage with models of identity and practice that go beyond inculcation of knowledge (Thomashow, 1996). As Nazir and Pedretti (2015) point out, while there is growing consensus regarding the need to reimagine EE as actions based on care, and relational thinking, there have been very few studies that have explicitly designed interventions with such aims in mind. Involving teachers in such action-based research could be a significant step in this direction, helping facilitate their own reflections on the environment and seeding environment-oriented teaching practices.

Chapter 10 Discussion and Implications

"When dams were erected on the Columbia, salmon battered themselves against the concrete, trying to return home. I expect no less from us. We too must hurl ourselves against and through the literal and metaphorical concrete that contains and constrains us, that keeps us from talking about what is most important to us, that keeps us from living the way our bones know we can, that bars us from our home. It only takes one person to bring down a dam." ― Derrick Jensen

In this chapter

The research studies reported here were driven by a central question: **how can we motivate students to participate in pro-environmental actions?** To address this question, I studied a community urban farm, which brought together some general challenges (such as growing food, composting) and the potential of environmental practices in cities. The results from this study indicated that community-based practices can provide useful insights towards developing an action-oriented pedagogy for developing ecological sensibilities in adults. These insights were used to design and study a school farm intervention. Together, the two studies showed that encouraging diverse motivations, through participation in practices that offer rich, sensory engagement with nature, and afford an integrative perspective, could be a first step in helping students move towards environment-oriented actions. The school intervention also acts as an illustrative case, to demonstrate how children's participation in a school farm can extend to environmental actions in their neighbourhood, and engage the larger community, through shared actions.

Similar design of further interventions could help seed wider environmental perspectives, rooted in the values of interdependence, care, and the well-being of more-than-

human living beings. EE based on such interventions would emphasize direct experience, somaesthetic engagements, a relational way of thinking, and affective outcomes, rather than information-based knowledge and a detached perspective. Imagining schools as community outreach hubs, and training teachers to develop local, context-based EE interventions, are key policy recommendations.

Introduction

The research studies reported here were driven by a central question: **How can PEA be motivated?** To address this question, I studied a community urban farm, which provided insights into how motivations can evolve through artefact-based practice in adults. This study characterised the main features of the farm practice, in terms of motivational scaffolds and actions of the participants, and how the practices helped volunteers move towards environmental perspectives and actions. The key outcomes of this analysis were:

I) Feedback and competency in community-based practices motivate individual sphere of actions, which can then extend into the wider community.

II) Ecological perspectives are embedded in 'performative' substances, and such substances help generate a pro-environmental narrative through volunteers' participation in 'coagulative' community practices.

The other central question driving my thesis work was, **how can we design a school-level intervention to motivate PEA?**

The findings from the adult study were used to design a school-level intervention. The analysis of this data revealed the following:

III) Somaesthetic encounters are central in developing care-based relationships with the environment.

IV) Shared-practices lead to environmental motivation, and the extension of pro-environmental actions to the wider community.

In this chapter, I briefly summarise the findings (Section 1) and then discuss their theoretical, pedagogical, and policy implications (Section 2). I then outline the contributions and limitations of the study (Section 3), and conclude with potential directions for future work (Section 4).

10.1 A brief summary of findings

1. *Diverse motives may drive individuals to join an environmental community-based practice*

Participation in environmental actions need not stem from explicit altruistic motives to 'help nature'. Rather, in many cases, personal reasons can act as an entry point to start an activity. Eventually, the extent and nature of participation can expand one's notion of self-interest such that the well-being of the immediate environment is seen as essential to one's own. Sustained interaction with artefacts and practices can be a way in which volunteers pick up the 'embedded' normative positions. The 'drive' (towards PEA in this case) is not transmitted through explicit talk, but it is rather implicitly generated through lived experiences of the participants and related discussion. Thus, it might be incorrect to assume that only individuals motivated to preserve/conserve the environment would be interested in participating in environmental actions. The model of environmental actions stemming only from altruistic motives also reinforces a dichotomy between individual well-being and environmental well-being, treating them as distinct and mutually exclusive. Further research to understand diverse motivations, and how they could converge towards environmental motivations, could help in addressing this dichotomy.

2. *Sustained participation, mediated through 'performative' substances and 'coagulative' practices, support the development of an ecological stance towards the environment*

Results from the studies indicate that embodied experiences, through interactions with 'performative' substances such as compost, *Amrut-Jal, Amrut-Mitti* etc., expanded the action possibilities of students in relation to various artifacts in their environment. This idea is in alignment with recent studies in cognitive science, which report how interactions with physical artifacts critically change the cognitive processes of participants (Hutchins, 1991; Nardi, 1996; Clark, 2008; Rahaman, Agrawal, Srivastava, & Chandrasekharan, 2018). Gallagher and Ransom (2016) extend this model to include the role of artefacts as affective and emotional anchors, that are embedded in evolving social norms. Artefacts "become part of a broader 'web of cultural meaning' that enables a range of nuanced and normative action-perception cycles" (p. 340). Students' encounters with entities such as seeds, leaves, wet waste etc. created new action possibilities, as well as narratives, regarding what constitutes environmentally-responsible behaviour.

3. *Pro-environmental motivations develop through individual and group narratives of the actions performed*

The studies indicate shared activities nurture group narratives, which further strengthen collective identities, such as a school neighbourhood that perceives itself as an environment-friendly community, through becoming plastic-free or starting composting. Individual motivations can thus develop through narratives generated from participation in collective

actions, wherein one begins to identify with the group, and 'tap into' the embedded perspectives driving the systems.

4. *Somaesthetic interactions contribute to an embodied sense of care*

Visceral experiences of activities in the farm engage a wider spectrum of senses and their combinations, which allows one to attend to previously ignored features of the environment. This paying attention also allows one to be especially sensitive to changes, which can act as a feedback (such as budding of a flower, or early signs of a pest affecting a plant), and thereby respond accordingly. Through paying close attention, individuals begin to participate in acts of care, and are motivated to deepen their relationship with the 'cared-for' (Noddings, 2013) environment, based on the response.

5. *Shared-actions can widen the sphere of community-practice, through social motivation*

The possibility of forming/ strengthening social bonds through shared actions acts as a motivation to participate in similar activities. As seen in the studies, the experience of togetherness attached to social interaction and affiliation not only motivates individuals to seek pleasure in social interactions (affective reward) but also works to extend the social bonds (Godman, 2013; Godman, Nagatsu, & Salmela, 2014). These actions are mediated through the artefacts of practice, which act as tangible media for shared interactions.

10.2 Implications of the thesis

10.2.1 Theoretical implications

a) *Towards an enactive account of motivation*

This study highlights the dynamic and emergent nature of motivational processes, and the role of artefacts and practices in supporting individual/ community-level pro-environmental actions. This understanding of the relational and emergent nature of individual actions challenges the current dichotomous conception of motivation, as directed towards satisfying oneself or others. We tracked situational factors and sensorium-based responses, to understand the role of affect in directing the motivation of individuals, particularly to pay greater attention to their environment. Based on this characterisation study, experimental studies could now be designed, to study the psychological effects of plant-based interactions, such as stress-reduction (Lee, Lee, Park & Miyazaki, 2015), emerging feelings of generosity (Weinstein, Przybylski & Ryan, 2009), restoration of attention (Berto, 2005) etc., which could lead to more mechanistic explanations of motivational processes. In related work, Basu, Duvall and Kaplan (2018) argue that exposure to nature encourages what they term as 'soft fascination', which helps restore attentional capacities, while leaving space for mental reflection and relaxation. They contrast this effect from the effects based on other media exposure (such as TV etc.), categorizing these as avenues for 'hard fascination', which actually drain mental resources, rather than providing a source for relaxation. Investigating the relationship between soft fascination and motivation, particularly to engage in care-based interactions, could be a productive research area, bringing together cognitive science and environmental studies.

b) Evolution of values though sustained artifact-based practices

The thesis project focused on understanding and seeding motivational processes leading to PEA. However, the findings suggest that farm participants experience a normative shift in

their perspectives, which can be understood as a change in values. Many participants reported developing pro-environmental values such as frugality, re-usability and promoting bio-diversity, which emerged through sustained participation in group activities that embed these principles. This indicates that ecological practices such as farming are a way to help implicitly develop an alternative value system towards the environment, which can compensate for the dominant values system, which takes a linear, modular and transactional approach towards the environment.

This is not surprising, because every practice requires some kind of embodied experience, which would generate values implicitly. For instance, spoken language and writing practices generate their own value systems (Ong, 2013). However, the values generated by these and similar practices would not be similar to the ones generated by the farming experience. If the nature of the practice is linear, modular, and transactional – as in the case of assembly-line-based practices and modern technology-based practices in general – the values that develop implicitly would also have a similar linear, modular and transactional nature. This structure (linear, modular, transactional) is dominant in most modern practices, as this structure is required for achieving economies of scale and generation of surplus capital (Date, Dutta & Chandrasekharan; 2019). From the standpoint of the proposed model of motivation, this all-pervading structure would account for the currently dominant value system towards the environment, which is also linear, modular and transactional.

c) *The 'mattering' of matter*

The findings from this thesis project support recent ideas about the constitutive character of artefactual engagement, particularly in generating thoughts and emotions (Malafouris et al. 2018; Xenakis & Arnellos, 2014). In this view, cognitive capacities are not just enacted, but *created* through interactions with physical entities in the environment. I extend this argument to include the evolution of values through material involvement. The findings from the study show that the process of using entities such as compost, seeds etc. was as important as the goal (in this case, growing vegetables). As Malafouris (2018) describes, the *withness* and *throughness* takes precedence over *aboutness,* as one is constantly *becoming-with* and *through* the world. Extending this view, Barad (2003, 2007) describes the self as emerging through what she labels as 'intra-actions'[1], to describe how material forces *constitute* materialisation. The radical part of the argument denies prior existence to independent entities, insisting instead that relationships are the defining characteristic of a phenomenon. This view questions the assumed independence of interacting entities, as intra-actions are what make up the entities in the first-place. This view problematizes the familiar notion of causality, arguing instead that 'individuals' emerge from the 'mangle of practice' (Pickering, 2010). The role of 'more-than-human'[2] encounters in constituting and shaping human thought and action, when acknowledged, challenges standard notions of agency and independence (and thereby create conceptual space for enchantment, reciprocity and humility) (Afifi,

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1 According to Barad (2007), phenomena (rather than independent objects) are "the basic units of existence" (Barad, 2007, p. 333). Phenomena are produced through intra-actions; as Barad specifies, "it is through specific agential intra-actions that the boundaries and properties of the 'components' of phenomena become determinate and the particular material articulations in the world become meaningful"

2 According to Affifi (2016), "The term acknowledges and positions humans as within, as of, something bigger than is generally apparent, as it invites us to further the incomplete though ever-necessary phenomenological project of disclosing more-than-humanness in experience."(p.161)

2016). The discussions based on this thesis project could contribute to providing an empirical basis for a version of this narrative. Further, this work could help develop a critical synthesis of emerging disparate frameworks[3] (that have otherwise evolved from distinct traditions), centered on the emergence of non-anthropocentric value perspectives through practice-assemblages (Ingold, 2000).

d) *Centrality of affect in generating an 'ethic of care'*

The results show that affective experiences can contribute to the perception of one's connection with nature, which in turn directs subsequent beliefs and actions. More generally, empathetic responses to a situation develop from the affective responses to manifold aspects of the environment. In related work, Quigley and Lyons (2013) comment that EE is in dire need of pedagogical interventions that constitute *both* emotional and intellectual experiences, because emotional engagement indicates deep involvement with the learners' psyche. Ahmed (2010) uses the term 'sticky' to describe the nature of affect. She writes, "affect is what sticks, or what sustains or preserves the connection between ideas, values and objects" (p.29). Building a meaningful relationship with the environment requires immersive, sensorium-based experiences, which generate the rich, moral imagination necessary to think and act in pro-environmental ways. Given the atrophied and opaque nature of socio-ecological relationships in cities, facilitating such rich experiences, and understanding the challenges in acting upon them, is a promising, and urgent, area of research.

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[3] 'New Materialism' from epistemology of science, feminists and STS scholars; Situated and embodied cognition from phenomenology, neurobiology, robotics

e) *'Solving for Pattern' as a desirable manifestation of an ecological perspective*

The study of community participation in urban farming practices highlighted instances where volunteers made wider associations (such as to health of soil, growth of plant, need for microbes, quality of compost, diet of cattle for cow dung etc.) that were otherwise systematically compartmentalized by their urban existence, neatly categorised in terms of production, consumption and waste disposal. Growing food using traditional practices (as described in Chapter 3 and 5 in the context of farming) helped them break these artificial (in the sense of siloed modes of production and consumption described above) categories, and behaviors based on them, to create larger cycles of interrelatedness, encompassing various forms of life, ranging from bacteria to food and cattle. The practices in the farm thus connected the act of consuming food to the conditions under which food is grown and brought to our plates. The practice thus implicitly led to a systemic way of thinking about the human-nature relationship – a value system. Martusewicz and Edmundson (2004) call this way of thinking and acting as a form of 'collaborative intelligence', because it recognises the constitutive role of environmental processes, and its reciprocal role in generating human cultural forms. The well-being of one cannot be satisfied without the flourishing of others. Farmer and philosopher Wendell Berry terms the ability to understand and respect these interconnected relations of living systems as 'Solving for Pattern'. He comments,

> "A bad solution solves for a single purpose or goal, such as increased production. And it is typical of such solutions that they achieve stupendous increases in production at exorbitant biological and social costs. A good solution is good because it is in harmony with those larger patterns ... It is the nature of any organic pattern to be contained

within a larger one. And so a good solution in one pattern preserves the integrity of the pattern that contains it."

Further, he adds,

> "... all who are living as neighbors here, human and plant and animal, are part of one another, and so cannot possibly flourish alone; that, therefore, our culture must be our response to our place, our culture and our place are images of each other and inseparable from each other, and so neither can be better than the other".

Practices that support the development of sensitivity and responsibility to attend to, and care for, larger ecosystems, also provide the means to imbibe a 'Solving for Pattern' approach. This stance then informs one's action in every situation, thus contributing towards an ecological perspective. Further research into the connection between the way understanding of interrelatedness emerges, and its role in developing the ability to solve for pattern, would contribute significantly towards undoing the damage our species have done to the planet's ecosystems.

10.2.2 Pedagogical and Policy implications

a) *Training educators to 'Solve for Pattern'*

Teaching is not, and cannot, be a value-neutral enterprise. Ladson-Billings (1994) argues that larger moral and epistemological aspects are embedded in the act of practicing any pedagogy:

> "Pedagogy refers to a deliberate attempt to influence how and what knowledge and identities are produced within and among particular sets of social relations. It can be understood as a practice through which people are incited to acquire a particular 'moral character'" (p.14).

It is worth considering the 'moral character' that is developed by conventional forms of teaching, which are based on disconnected and abstract knowledge. Such pedagogical practices tend to reinforce transactional modes of relating to living systems, by reducing the complex connections to linear and disconnected categories. In contrast, practicing what Martusewicz (2019) calls a 'pedagogy of responsibility' calls for interventions that can make explicit the obligations we owe to the life-sustaining environmental entities and processes around us. Such interventions would have 'Solving for Pattern' as an overarching design perspective, to make salient the connections between human and more-than-human communities.

These principles can be put into practice through a number of practices that allow for visceral interactions, require some form of stewardship, and provide the space for cultural-ecological[4] dialogues to emerge. Such practices require new forms of teacher-training, where teachers need to be trained to think beyond disciplinary boundaries, and to develop skills to engage with local, action-oriented issues that could be connected with the curriculum.

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[4] Cultural-ecological dialogue focuses less on the individual as source of moral authority and more on cultural sources and ethical implications, in emphasizing tradition as a source of wisdom rather than just of oppression (as is often a part of critical dialogue in Freirean tradition), and in validating sources of knowledge/practices other than rationalism. (Armstrong, Kimmerer & Vergun, 2007; Dillon, 2015; Martusewicz and Edmundson, 2004)

Apprenticeship with different community initiatives, as part of teacher-training and based on individual interests, could be a possible channel to develop these perspectives and skills. As a contribution to teacher training towards PEA, I have written a primer on urban farming for anyone interested in the activity. This is being published by an education magazine and would be freely available to teachers (Appendix 1).

b) *Designing interventions that encourage sustained participation through ownership, feedback, care and collaboration*

Schools and other educational institutions could focus on a local issue (such as water management, waste disposal, food production etc.) and collaborate with a community already working on the issue. Creating and participating in a set of practices would help educators understand the different patterns underlying the issue. What would be a 'performative' substance in the given context? How would their intervention contribute to 'Solving for Pattern'? These questions could act as an overarching framework for the design of a relevant intervention towards PEA. For instance, a local beach clean-up initiative would not remain limited to a one-time clearing of plastic debris. In order to encourage ownership, students could be asked to monitor the beach every week, and observe the local fauna and flora. Specific areas could be created to facilitate a habitat for creatures such as turtles, crabs etc. Conversations could be held with local fishing communities to understand their practices, and know more about the seasonal cycles of fish breeding. Suitable vegetation (such as mangroves) to prevent flooding could be planted nearby. All these actions thus emphasize 'how can a beach flourish?', rather than limiting the cleanup to mitigation of garbage dumping.

c) *Re-imagining schools as outreach hubs for local engagement and community-based practice*

Schools are ideally positioned to function as outreach hubs within a local community, owing to their existing ties with the students and parents. They can function as a common space to attempt diverse initiatives, and encourage greater participation as well as collaboration of teachers and parents. Such partnerships can help reduce the load that are otherwise exclusively borne by teachers, and also help in making school activities more transparent and participatory. Strengthening community involvement also subverts the consumerist model of a school system (Apple, 2001; Baltodano, 2012), by sustaining context-specific and place-dependent interactions. Creating space for such engagements within the formal curriculum has immense potential to seed grassroots movements across different localities.

d) *Designing initiatives focused on urban environment engagement*

As cities are poised to grow, urban design will play a crucial role in determining long-term challenges pertaining to sustainability, resilience and flourishing of ecosystems. India recently launched an ambitious project to turn urban areas into 'smart cities'. According to the mission statement,

"the purpose of the Smart Cities Mission is to drive economic growth and improve the quality of life of people by enabling local area development and harnessing technology, especially technology that leads to Smart outcomes. Area based development will transform existing areas (retrofit and redevelop), including slums, into better planned ones, thereby improving liveability of the whole City. New areas (greenfield) will be developed around

cities in order to accommodate the expanding population in urban areas. Application of Smart Solutions will enable cities to use technology, information and data to improve infrastructure and services."[5]

While the aims to improve built infrastructure and services are laudable, the urban environment needs equal attention. Far from being barren, urban areas can be rich pockets of biodiversity, with native and non-native species assemblages (Faeth, Bang & Saari, 2014). These provide important means to deal with the challenges of climate change and its related effects. Co-existence and mutual well-being of living systems in cities also encourage social bonding and stewardship, as people from different walks of life participate in group activities (Svendsen, Campbell & McMillen, 2016). Thus, to avoid the adverse environmental consequences of urbanization, ecologically rich spaces (such as wetlands, forested areas, farm plots, beaches etc.) need to be defined, preserved and made an important part of the lives of people. As Russ and Krasny (2017) comment, "The story of cities as ecological spaces needs to be told, both in cities and outside them: to adults and to the many young people who increasingly populate the world's growing cities... Such stories will have a critical impact on the willingness of the inhabitants of the cities of the future to protect and care for—and create—their urban environments" (p.18). This thesis highlights one way in which citizens could participate in transforming their local landscape into a greener, liveable area, while also subverting the opaque, exploitative supply-chain economy of food production.

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5 Retrieved from www.smartcities.gov.in; URL: http://www.smartcities.gov.in/upload/uploadfiles/files/What%20is%20Smart%20City.pdf

10.3 Contributions and limitations of the study

10.3.1 Contributions

This thesis is the first systematic research project in India to:

- Focus on motivation to act in pro-environmental ways as a pedagogical aim, and design an evidence-based intervention to explore motivational processes at the level of community interactions.
- Characterise elements of practice in a community-based initiative, to understand motivational processes from an embodied and situated cognition perspective.
- Propose an enactive model of motivation, to account for evolving values and motives.
- Use the existing research in embodied and situated cognition to further the literature in environmental motivation.
- Design an urban farming intervention for schools in the Indian context.
- Analyse the scope of school farming activities from an affective and action-promoting perspective (rather than the conventional knowledge acquisition perspective).

10.3.2 Limitations

This study was done based on available groups and interventional opportunities, in a time-bound manner. This process sets a number of inherent limitations on the results, which are highlighted below:

- The thesis focused on developing pedagogical interventions based on a practice-driven model of motivation. This framing of the thesis limited the studies to exploring

the environmental sensibilities and actions of individuals in the context of evolving human-nature relationships (even if they arise from pragmatic concerns). In its present form, the study and its findings thus do not extend to issues discussed in political ecology, particularly how environmental justice movements arise from threat to livelihood options of the marginalised populations (Martinez-Alier, 2013). In the latter cases, individuals/ communities face significant backlash from powerful groups having capitalist/ 'development' related interests in the area. The motivation to resist these forces comes from more fundamental needs of survival and livelihood (which are in many cases already ecologically sustainable as a way of life), rather than ideas of preservation or conservation of environment.

- The range of actions displayed by the adult farming community, as well as the school students, were limited to small, constructive tasks facing negligible systemic opposition (as in the case of protesting against building dams or clearing forest areas etc). Additionally, while a shift in perspectives regarding recognising the inter-relatedness and inter-dependence were observed, it wasn't clear if participants could think critically regarding the trade-offs involved (such as impact of agroecological practices on rural livelihoods, increase in public transport at the cost of clearing forest areas etc). These are systemic issues with no straightforward answers, so it is likely that relevant knowledge is required in addition to motivated action. Thus, it remains to be seen if local, constructive actions can translate into large-scale social initiatives, especially in the face of resistance or inertia from the larger socio-economic system.

- A relatively homogeneous (from a socio-economic perspective) group of middle-class students individuals were analysed as part of the study. Given the wide disparity in

income and access within cities, interactions across a more diverse sample could have yielded different, and possibly richer, insights.

- More iterations of the school-terrace intervention could have yielded more robust results.
- A longer association with students post their farming experience could have yielded more information regarding their perspectives and actions, but logistical issues made such systematic interviews difficult. Only a few anecdotal reports could be collected.
- Interactions and workshops with teachers have been planned, but could not be executed and analysed in time to report in the thesis.

10.3.3 Challenges to the model

The model is drawn from a limited number of cases, and only provides a tentative description of the motivation process. Some other challenges that could arise are as follows:

- Neglect of language and information-processing pathways: In order to scope the study, and emphasize the usually neglected aspects of emotion and other non-representational factors, language-based affect has not been systematically included in the model. Heightened affective states arising from language could impact information-processing in significant ways, and these effects could feed back into the motivation system. Also, the role of representations and memory (which are important parts of goal-directed behaviour) has not been adequately analysed in the model, though their role is tacitly assumed when discussing community-practices.
- Narrow conception of emotions: While the model recognizes the importance of affective states, these have not been exhaustively identified and studied. For instance, emotions ignored by the model, such as anger and hatred, which are channeled by

ritualistic practices that make in-group, out-group differences salient (see Whitehouse, 2018), could also shape actions, and strengthen motivation in different ways.

- Missing mechanistic account: The model hints at cognitive and biological mechanisms that could account for motivation processes, but does not provide any details of these dynamic structures. The model is thus mostly descriptive.

10.4 Directions for future work

There are a number of research-oriented as well as pragmatic directions to extend the work done in this thesis. These include:

- Developing more case studies to characterise 'performative' substances and 'coagulative' practices across different pro-environmental community initiatives.
- Creating modules and resources for teachers to practice farming activities in school areas.
- Creating avenues for community participation in local, environmental practices. This may involve working with grassroots NGOs, media reporters and civic bodies.
- Developing the motivation model to include situations where there exist considerable structural barriers. In other words, what are the connections between motivation to pursue an outcome, and building resilience to remain motivated in the face of adverse effects? Research in this direction is important, given the difficulty and high chances of community rejection involved in the practice of environmentally-responsible actions.

- Developing experimental protocols to investigate mechanistic explanations of motivation involved in shared actions. For example, some interesting studies have explored common neural mechanisms underlying motor synchrony, emotional contagion and social conformity, whereby each action is reciprocally linked to the other (Gallagher & Allen; 2018; Shamay-Tsoory, Saporta, Marton-Alper, & Gvirts, 2019).

10. 5 Conclusion

One of the strangest things about our culture is our ability to describe the destruction of the world in exquisite, even beautiful detail. The whole science of ecology, for instance, describes exactly what we're doing wrong and what the global effects are. The odd twist is that we become so enamored of our language and its ability to describe the world that we create a false and irresponsible separation. We use language as a device for distancing. Somebody who is genuinely living in their ecosystem wouldn't have a word for it. They'd just call it the world. —Ursula LeGuin

This thesis was motivated by a pragmatic concern regarding our collective inability to respond to the the growing environmental crises in an impactful manner. However, a deeper worry stems from understanding the manifest collapse of the ecosystem as just symptomatic – of our fractured relationship with nature. How could we bring about an 'ontological transformation' (Payne, 2016), such that our lived reality reflects a meaningful grounding within the patterns of the ecosystem? It is not enough to be literate about ecological problems and short-term solutions. Rather, education has to generate actions and values that shape

people's way of *being* in the world. Being requires *becoming,* through an openness to encounters that foregrounds experience over knowledge.

Bai (2009) exhorts us to snap out of the 'spell of the discursive' that lays claims on our perception by imposing an abstract, symbolic and logical view of the world. Instead, one must be willing to participate in, be affected by, and care for the relations existing within the environment. In an attempt to articulate such desired perspectives towards Nature, I explored farming as a practice that allows one to embody the reciprocal relationships embedded in the health of the land, soil and living beings dependent on it. Based on my findings, I argue that community-farming could be an important way to motivate people to re-establish connections with the ecosystem.

That said, this thesis is ultimately bound by words, and thus in some way falls into the same trap of linguistic artifice that it sets out to critique. In order to 'feel in your bone' what I am trying to convey, I invite you to step out and till some soil, watch a plant grow, attend to the bees hovering near the flowers. That is the learning we all need to be part of.

Publications based on the thesis

I) Peer-reviewed papers

- Date, G., **Dutta, D.**, Chandrasekharan, S. (2019). *Solving for Pattern: reshaping the building instinct, to move beyond efficiency*. Environmental Values
- **Dutta, D.**, Chandrasekharan, S. (2019). *Seeding embodied environmental sensibilities: Lessons from a school terrace-farm in Mumbai, India*. Case Studies in the Environment
- **Dutta, D.**, Chandrasekharan, S. (2017). *Doing to Being: farming actions in a community coalesce into pro-environment motivations and values*. Environmental Educational Research.

II) Peer-reviewed conference papers/posters

- **Dutta, D.**, Chandrasekharan, S., (2018) *"I told my mother to mulch the plants!": exploring intergenerational influence in generating pro-environmental actions, through the development of a 'joint-action space' in an urban farm*. XVIII Symposium of the International Organization for Science and Technology Education, August 13-17, Malmö, Sweden.
- **Dutta, D.**, Chandrasekharan, S., (2018) *Humus and humility: situated and embodied interactions constitute a lived morality towards the environment*. 7th EcoJustice and Activism Conference, Theme: Practicing Affection in a Culture of Slow Violence, March 8-10, College of Education Porter Building, Eastern Michigan University
- **Dutta, D.**, Chandrasekharan, S., Gupta A. (2018). *"The soil is alive!" – Exploring emergence of embodied environmental sensibilities in an urban farm*. epiSTEME 7: International Conference to Review Research on Science, Technology and Mathematics Education, January 5-8, Mumbai
- **Dutta, D**., Chandrasekharan, S., (2017). *Time for Action: Towards an integrative practice-based environment education*. Paper presented at Philosophy of Education Conference, Bangalore, India, 9-11 January
- **Dutta, D**. & Chandrasekharan, S. (2016). *Practice-based approaches to nurturing environmental values: A case study of an urban farming group in Mumbai*. Second Graduate Seminar School of Public Policy & Governance, Tata institute of Social Sciences, Hyderabad, India
- **Dutta, D.**, & Chandrasekharan, S. (2015). *Developing a curricular framework for ecological sensibilities: exploring the activity of urban farming as a critical and relevant intervention*. Proceedings epiSTEME 6: International Conference to Review Research on Science, Technology and Mathematics Education (pp 292 -298). Mumbai: Cinnamonteal.
- **Dutta, D.**, Chandrasekharan. S. (2015). *Developing an educational framework for ecological sensibilities: A philosophical perspective*. Abstract book of the 3rd International Conference on Creativity and Innovations at Grassroots, Ahmedabad, India.

Chapter 12 References

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Appendix 1 Pedagogy of ‘Dirty’ Hands: Reflections: Reflections from an urban terrace farm

The following pages (241-250) are a reprint of an article published in the August 2019[1] issue of the educational magazine, *IWonder.*

[1] Dutta, D. (2019). Pedagogy of 'dirty' hands reflections from an urban terrace farm. *IWonder, (3),* 72-81.

PEDAGOGY OF 'DIRTY' HANDS:

REFLECTIONS FROM AN URBAN TERRACE FARM

DEBORAH DUTTA

Urban areas are often viewed as a source of ecological 'problems' rather than solutions. This article presents the rationale, pedagogical implications, and student responses to a school project aimed at raising and sustaining an urban terrace farm. Through this example, it explores some themes that educators could engage with in urban areas.

At 7:00 am, the morning light is feebly making its way through the smog engulfing Mumbai in winter. Most people might want to stay snug in their beds, but at least 20 teenage children are excitedly running up to the terrace of their school. "*The cabbage seeds have sprouted!*" exclaims a girl, gingerly touching a tiny leaf. Elsewhere, a group of students are debating ways to handle a pest attack on one of the plants. Some of the students taste the leaves of the Indian Roselle (*Ambadi*), and enthusiastically encourage others to try it; "*Arey taste kar, khatta hai! Mast taste hai!*". For the next hour, these students work diligently towards mulching, sowing, harvesting, observing, and exploring over 20 varieties of edible plants that comprise their terrace 'farm'. In less than a year, a barren terrace, usually locked out of view, has become a hub of activity and neighbourhood attraction.

Terrace farming: A revolution on rooftops

Urban areas are generally far removed from areas of food production. Typical food products travel hundreds of kilometers, burning fossil fuel for transport and cold-storage, before being packed into plastic wrappers and displayed in grocery stores. Turning the basic necessity of food into a commodity so far removed from its source creates a pool of passive urban consumers who are unable to build or understand a relationship with food that goes beyond monetary transactions. Wendell Berry, a farmer and environmental activist, suggests that growing food responsibly may be the first step in reclaiming our connection with land. Farming as an activity naturally provides a space to raise questions and develop an integrated understanding about weather, food, nutrition, the economics of food production, water, and local geography.

Fig. 1. The ecological, economic, and social benefits of urban farming. Each of these can be a theme for discussion and research with students.

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The scarcity of land in 'megacities', like Mumbai, has led to the emergence of an interesting alternative — using rooftops to grow food. Many individuals and volunteer groups are now growing a variety of fruits and vegetables on their rooftops using traditional and organic farming principles. These have had encouraging results, both in terms of yield and the health benefits of engaging in the physical activity of farming. This practice has improved awareness of and access to fresh, seasonal, and local food. Food growers often come together to share their knowledge and skills (in identifying local vegetables and sowing times, developing recipes, and finding ways to care for their plants etc.) in ways that contribute to a sense of community. Terrace farms also provide a venue for compost from biodegradable household waste, which would otherwise contribute ~50% of the waste dumped at landfills. They improve urban biodiversity by creating habitats for insects, reptiles and birds (see **Box 1**). These farms can also contribute to better air quality and micro-climate regulation in the long run (see **Fig. 1**).

The pedagogy of 'dirty' hands

Being able to provide students with authentic experiences of engaging with the local environment is important in fostering an understanding of diverse ecological

Box 1. Biodiversity on the terrace farm:

Despite its modest size, the school terrace farm is visited by many butterflies, dragon flies, lady birds, lizards, snails, sparrows, and spiders. Organisms frequently seen in the soil include earthworms, centipedes, millipedes, and beetles (see **Fig. 2**).

Student observations and interactions with the farm's biodiversity have the potential to open up larger discussions on conceptions of the 'human–Nature' relationship. For e.g., on spotting a bee caught in some water collected at the base of an upturned leaf, some students promptly went about 'rescuing' it by draining the water, and letting it fly away. Other students wondered if we should have interfered in the bee's fate, since Nature is believed to operate on the principle of 'survival of the fittest'.

As the farm has flourished, students have started appreciating the role of different organisms in the process of growing food. For e.g., sightings of lady birds and ants near an aphid infestation on some plants provided tangible examples of food webs that might exist on the farm. In another instance, some students expressed their willingness to 'share' the farm harvest with giant snails (usually considered a pest) because "*the snails also needed some food*".

Fig. 2. Some frequent visitors to the terrace farm. (a) A bee on the Blue Spike plant. (b) A butterfly on the terrace. (c) Students discovering snails on their farm.

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practices. While schools are an integral part of any community, the notion of experience tends to get simplified and uncritical within the structure of formal education. Many activities, especially those meant to nurture environmental sensibilities, tend to take the form of tokenistic actions (planting saplings on Earth day, making 'Save the Tiger' posters etc.) without the possibility of any feedback or consequence. On the other hand, textbooks are filled with bleak scenarios of environmental degradation, leaving students acutely aware of 'big' problems, but disempowered to bring about any transformation in their own locality. Many educators have, therefore, argued for the need for 'authentic participation'. This involves experiences where students feel a sense of ownership, and take responsibility for the task at hand. However, this isn't the same as unguided learning; rather, it is conducive to collaborative learning environments where knowledge isn't seen to be transmitted only from teacher to student.

Box 2. Why a farm?

The usage of the term 'farm' as compared to a 'garden' reflects the project's emphasis on cultivation of food crops rather than purely ornamental plants. The farm was designed with a focus on sustainable practices intended to challenge the idea that conservation necessarily happens in uninhabited places, far from human influence. While there are legitimate arguments for conservation of sensitive areas, simply treating urban spaces as 'human' problems, and 'Nature' as being some faraway pristine place is problematic for several reasons. Firstly, it creates an artificial separation between humans and the surrounding environment. Secondly, it discourages the idea of humans developing a 'positive' relationship with Nature based on care, and empathy. Lastly, by shifting the onus solely on city-planners and government policies, it disempowers people from taking ownership and responsibility for improving their own neighbourhoods. From this perspective, starting a 'farm' was a deliberate choice with certain ecological and political commitments.

Combining ideas of 'authentic participation' with possibilities of practice in terrace farming (see **Box 2**), a class of VIII graders from a Central Board of Secondary Education (CBSE) school were involved in setting up an edible farm on their school terrace (see **Box 3**). The school managed to allocate an hour every week, in the mornings, for this ungraded project. With the coming together of a small core team — consisting of a researcher, a couple of teachers (who facilitate the school nature club) and two enthusiastic school gardeners — the project began to gradually take shape (see **Box 4**).

To meet the initial need for organic matter, the core team began with digging a small compost pit in one corner of the school grounds. Students began collecting dry leaves (from the neighborhood) and raw kitchen waste (from the school canteen) for composting. This collection activity led to discussions about plastics and other non-degradable materials found in household waste. In the meanwhile, discarded cardboard boxes and plastic

Box 3. Edible plants — eat what you grow!

The term 'edible' plants is used here to refer to plants whose parts can be eaten by humans in raw or cooked form. In the initial stages of the project, the core group selected plant species based on their ease of growing, availability (with a focus on locally grown species), and diversity (tubers, cereal grains, fruits, and leafy vegetables). This included lemon grass, ova (Ajwain), ladyfinger, sponge gourd, sweet potato, Indian roselle, chillies, brinjal, radish, cabbage, spinach, waterleaf, and millets etc. A few flowering plants (e.g., marigolds, blue spike, periwinkle) were included to attract pollinators. Some herbs (e.g., mint, basil, spearmint) were included for their shade tolerance and ability to act as pest repellents (due to their strong smell). Some leguminous plants (e.g., moong, beans, tur dal etc.) were cultivated for their ability to improve soil fertility by 'fixing nitrogen'. In later stages of the project, some plant species germinated from the compost itself. The farm also grew with some contributions from interested parents.

Harvesting plants had the tangible output of helping students stay invested in the project, and derive a sense of achievement from it (see **Fig. 3**). Getting a sense of the range of issues, time, and patience required to grow and harvest healthy vegetables helped students draw connections between their work and the immense effort that farmers invest in feeding us.

Fig. 3. Students with their first harvest.

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bottles were used to grow plants (see **Fig. 4**). Within a month, saplings of several herbs and greens were planted. Some plants, such as pumpkin, pomegranate, papaya and guava, grew from the compost itself, much to the delight of the students. Slowly, the farm started to expand.

The project used farming principles that combined the core group's tacit understanding of sustainable farming with the pedagogical goal of linking

Box 4. Initiating and sustaining a school project:

Since most schools have very tight schedules, initiating an extra-curricular project like the urban farm requires the support of the principal or school management. Aligning project goals with the broader aims of the school can be useful in getting this support. For e.g., the principal of this school was keen on introducing students to better waste management practices because the school's proximity to a landfill made this quite a tangible problem. Thus, the facilitator's emphasis on a terrace farm's role in introducing concepts such as composting and reuse of discarded materials to grow food helped ensure the principal's support for it. A general guide to approaching school management for projects such as these is available here: https://www.youcan.in/single-post/2016/05/03/approaching-a-school-principal.

To sustain such a project, it is also important to ensure that it gets some in-house support rather than being entirely dependent on external (to the school) help. In addition, teachers can help tailor the project to meet the needs and routine of the school. For e.g., the core group of the terrace farm includes teachers responsible for nature club activities in the school. It also involves an ongoing effort to include other subject teachers.

Designing the project to ensure that the time and effort it requires does not disrupt other school activities plays a vital role in sustaining it. For e.g., the terrace farm project was initially designed to involve 20 students working for two hours every week. However, it was only possible to carve out an hour of student time every Saturday. Similarly, given the packed academic schedules of grade IX and X students, the first students involved in the project were from grade VIII. This trend has continued, and students who graduate each year are invited to mentor students from the successive batch for a month. This has helped create a student 'teacher–learner' community across different grades. In the coming year, based on student interest (and that of their parents), the terrace farm may be opened once every fortnight for volunteer work. In this way, older students will have the opportunity to continue participating in the project outside school hours.

Fig. 4. Carboard planters are used to grow a variety of plants.

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Materials on the farm	Supporting practices	Implicit views guiding the practices	Possible questions for discussion with students
Nutrient rich soil	Collecting dried leaves and organic waste, making compost	Recycling of nutrients, redefining waste as resource	How much organic waste is produced in the school? What are the stages of composting? How long does it take? What are the different methods of composting?
Dilute cow-urine, dung, jaggery	Adding to soil and compost	Microorganisms as a core part of soil; symbiotic relationships	How does the soil look under a microscope? Is cow dung like a 'probiotic' for soil? Is it possible to distinguish roots of different plants from their smell?
Seeds	Saving seeds	Maintaining the cycle of life; seed sovereignty; stewardship	What are the major stages of a plant from seed-to-seed? How can seeds be saved for next season? How to select a fruit whose seeds will be saved? Why do farmers need to buy seeds? What is seed sovereignty?
Planters	Designing low-cost planters; making trellises	Frugality; reuse and recycle; locally sourcing materials	How to make a planter? What are the characteristics of a good planter? What kind of local materials could be used to build one?
Fruits and vegetables	Responsible harvesting	Stewardship; responsibility; reciprocity	How to choose vegetables and fruits for harvesting? Which vegetables are seasonal? How much would they charge for the vegetables they grow? How do their prices compare with the market price?

Fig. 5. A description of the core practices on the farm, and the perspectives underlying such practices. Topics for discussion can evolve around students' experience of these practices. A few are illustrated here.

different aspects of the environment in tangible ways (see **Fig. 5**). Consequently, students were exposed to these principles **through their sustained participation** in activities involving them, rather than explicit explanations. For e.g., over the course of the project, students became quite particular about mulching because they had observed that mulched soil (soil covered with biomass, such as dry leaves, or tiny creepers, such as mint and clover) remained soft and moist, while exposed soil tended to become compact and hard. Similarly, the realization that seeds would be needed for planting in every season and one couldn't always rely on getting new seeds from the market led students to recognize the importance of seed saving.

While core practices were followed regularly, day-to-day activities on the farm were largely contingent on the weather, status of the plants, and any other task on the farm that required immediate attention. For instance, during the monsoons, many of the cardboard boxes that were used as planters had to be moved around to allow the rain water to run off the slope of the terrace. The boxes had to be repeatedly reinforced with coir ropes and cardboard pieces to maintain structural integrity, and supports had to be constructed for growing creepers to climb on. Similarly, the higher bout of plant infections and diseases had to tackled with various organic methods. However, the unpredictability of the project helped students see it as a 'real' thing rather than just another school assignment. They saw the impact (good or bad) of their actions on the plants on the farm, and hence began to see themselves as being responsible for the health of the farm (see **Fig. 6**).

Fig. 6. The monsoons presented students with a host of challenges.

Fig. 7. A possible template for student journal entries. Students can be encouraged to share their experiences with peers, and make different time-lines for growth of individual plants based on their observations.

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Box 5. Student's prior experiences of gardening/farming:

Except for two children whose families owned farms in rural areas, the students involved in this project were mostly from exclusively urban backgrounds. Many of them had seen a few ornamental plants at home, but hadn't tended to them personally. In fact, a few confessed their disinterest in the activity. The following comment by a student illustrates the general sentiment:

"Earlier when my grandmother used to mention it (gardening), *it wasn't a topic of much interest to me because I did not know anything about it. So I used to just avoid this topic. But now that I have seen so much happening and it is so exciting, I have started to help my grandmother out. In fact, when I told her about all this* (terrace farming), *then she got hyped. ... Means totally hyped. On the same day, she did not tell me, she went to the nursery, bought a few saplings, seeds, pots, mud everything and she brought it home. Now, we are growing a lot of stuff."* — AN.

A typical session would begin with students observing the farm and having a quick discussion amongst themselves, followed by a quick recap of the previous week's work. Then, tasks for the day would be listed out, and students would be encouraged to include tasks based on their own observations. Students were also encouraged to maintain their own farm journals, in which they could write about or draw out their impressions of the day (see **Fig. 7**).

Student responses

The open-ended nature of the project allowed for a range of student responses. Since most students came from urban, middle-class backgrounds, they found many of the interactions and observations at the farm quite novel (see **Box 5**). The broad themes that emerged from these responses underline some of the key factors that motivated students to participate in farm activities and widen their sphere of actions.

(a) Somaesthetic interactions

Students were observed to engage with plants in a rich, visceral manner, through senses of touch, smell and taste (instead of just their eyes). Thus, the farm seemed to introduce students to different ways of perceiving the environment. For e.g., many students had never seen the plant called Indian Roselle *(Ambadi)* before they became part of this project. Once the plant had begun to grow in the terrace farm, students were informed that its leaves and calyx were edible. In the initial stages of the project, the mere idea of eating something directly off a plant was a novel concept for most students given that most of their interactions with food were in its packaged, frozen or cooked forms. However, their apprehensions soon gave way to curiosity, and students began to touch, sniff and tentatively nibble the *Ambadi* leaves. In another example, many students were initially repulsed with the organic matter kept for composting. They began shedding their inhibitions about handling it

after seeing saplings grow out of the compost, and discovering that the compost itself, when ready to use, had a sweetish smell. Soon, they began taking an active interest in preparing compost, often smelling it, feeling its texture, and poking around to look for earthworms — the presence of which would generate a lot of excitement. Given that they had started out with a bare space, the emergence of new life-forms and relationships led them to take more actions to encourage further growth. Such engrossed participation prompted a student to remark:

"...we never even touched plants this way earlier... I mean we play on the grass, but not this way. To take care... this time we learnt how to grow the plant, otherwise it is said that just drop a seed and the plant will grow... the book says that... but now I think the book is very fake, because the book only says what the author can see, but while doing it we see many different things..." — AY

(b) Novelty and challenge

Students found some tasks particularly challenging. These included figuring out a way to use bamboo poles to provide support for climbers, or repeatedly reinforcing cardboard planters to survive the monsoons. Often, these challenges would motivate students to come up with novel solutions. For e.g., they came up with the idea of designing supports in the form of tripods, and then worked together to build these structures for the farm (see **Fig. 8**). They reported the process to be quite enjoyable, perhaps owing to the fact that it involved peer validation and the tangible outcome of having a stable support for plants. As a student commented:

"...then most important was that trellis... making it was a fun job because we were trying different knots that we knew but had never really used. So, it was a very enjoyable..." — NM.

(c) Feedback

The evolving landscape of the terrace farm became an interesting form of feedback for the students, who started noticing different aspects of plant growth. This is evident in a remark made by one of them:

"...we studied that the tendrils wrap around the support, but now I actually saw how it wraps itself... we hadn't learnt about grouping plants (multi-cropping) *like this.. this is new, we haven't studied like this... I saw the good effects also.. Like that ajwain plant needed some shade... under full sun it didn't have so many leaves... now under a bit of shade (under a taller plant) it has grown a lot..."* — RN

Sustained engagement seemed to have been an important dimension in ensuring that students received continuous feedback regarding their efforts from other people, and from the artifacts themselves. The practice of sharing their impressions seems to have given students the impetus to widen the scope of their activities to include composting, the use of upcycled materials as planters, reducing wastage of food, and growing plants at home too.

(d) Nurturing broader perspectives

The various activities that students engaged with on the farm were gradually reflected in more thoughts pertaining to the environment in general. For e.g., plastic bottles are generally considered synonymous with trash, often ending up in landfills soon after they are bought. On the farm, however, discarded plastic bottles were cut and used as sapling containers — turning what is commonly seen as waste into a low-cost resource. For many students, the idea of recycling took on a new meaning as they began to look for other materials which could be used as planters. On the other hand, sorting plastic from organic waste for compost led to many discussions regarding its quantity in the environment. Students began questioning the use of plastic in packaging, and exploring potential alternatives. The use of dry leaves on the farm sensitized students to its usefulness as dry biomass. Not only did they make an effort to collect dry leaves from their neighbourhoods, but also attempted, in some instances, to stop locals from burning it.

Fig. 8. Students work on building support structures for the farm.
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Box 6. Social relationships around and through farm-related work:

Non-formal spaces, like the terrace farm, can help modify or build new relationships. For e.g., the farm seemed to help bring together inter-generational experiences because grandparents of the students involved in it were, in general, quite interested in the project. These grandparents now had the opportunity to share their knowledge of farming with grandchildren who seemed more receptive owing to motivations arising from their work on the farm. In another example, students expressed enjoyment in working together on the farm — a response corroborated by their class-teacher. Their teacher reported that working together on the farm had made students seem more inclined to form larger groups, and help each other in class.

The farm also seemed to help students appreciate that some of them could have a knack for things not included in conventional academics. For e.g., one student was very good at tying knots and would often be asked for help by others. It turned out that he wasn't considered a 'good' student and wasn't very popular until his talent for knots was discovered and appreciated. Another teacher reported a noticeable change in the behavior of a student who had recently joined school. Initially quite reticent, he had started becoming quite vocal after participating in some of the farming sessions. This was because his family owned a rural farm, and the student seemed to enjoy sharing his experiences of working on the farm as he felt that these were being valued by his peers. Another instance of this was seen when students visited an organic farm, in the outskirts of the city, that was managed by an IIT graduate. The farmer demonstrated techniques to prepare cow-dung slurry and manure, and introduced students to the variety of fruits, vegetables and trees he'd managed to grow on his farm. The students were quite interested in the farmer's professional journey, because it challenged the stereotypical notion of what 'educated' folks can or should do. It also introduced them to the possibility of farming as a serious vocation.

Credits: Deborah Dutta. License: CC-BY-NC.

Student engagement with processes like composting, and adding cow-dung slurry and mulch to soil helped them appreciate what was required to maintain the richness of soil. For e.g., a student remarked:

"...Earlier we thought [that] *soil is just something we get in packets, and plants will directly grow in it. But now we are realizing that it needs cow-dung, dry leaves, and many decomposition materials that improves the nutrients. This has really changed what I thought about soil."* — DV.

Parents and grandparents have started including a trip to the farm on their school visits. Some of them have started coming regularly, as volunteers, to learn as well as share their experiences of farming. Thus, this project has evolved into a community outreach effort (see **Box 6**). Many students bring seeds from their villages for the farm; a few have taken to growing some of these plants in their own homes. Students are also involved in selling saplings to the neighbourhood to raise funds to maintain the farm. In this way, the terrace farm is gradually transforming into a hub for seed and sapling exchange. In addition, the farm is beginning to get absorbed into the school's ethos, contributing to new 'teacher–learner' experiences that are based on student observations and interactions on the farm (see **Box 7**). For instance, a science teacher described how she had used the farm:

"VIIth and VIth [grades] *where I teach as well, they have similar lessons. Like plant forms and functions and plant reproduction. So I took them to the farm for a couple of classes, I showed them around. I showed them tendrils, parallel venation, reticulate root, tap root, fibrous root. What kind of fruits? How flower grows into fruit? What part of flower grows into fruit? What is sepal, what is a petal, everything... I could see the enthusiasm on their faces because they themselves observed tendrils, how they are coiling, what kind of support. For each plant also tendrils are different, because they are from the leaf. For pumpkins tendrils are different, for bitter gourd tendrils are different. Then shape of the leaves, different shapes and colour. Cabbage, cauliflower, they had never seen them growing as plants... It was such a novel experience for them that it will stay with them for a long time."*

Box 7. The farm as being integral to the school ethos:

The necessity of projects like the terrace farm becoming a sustained and integral part of the school ethos cannot be stressed enough. A one-off activity may leave an impression on students, but it usually falls short of creating an impetus for further action. For e.g., feedback and reflections stemming from continuous interactions with activities/ artefacts on the farm has helped nurture broader environmental sensibilities.

For projects like these to be integrated with a school's ethos, they need to be considered central to the student's educational experience rather than being relegated to an extra-curricular activity. This requires the support and involvement of the school management, teachers, and parents. For e.g., the terrace farm is slowly beginning to expand its sphere of influence. Teachers are being encouraged to draw linkages with the subjects they teach. Parents are being encouraged to volunteer in this project in their free time. Outreach to the neighbourhood is being initiated through student designed and facilitated hands-on workshops on composting, growing edible plants etc.

Glossary:

Frugality: Being careful and sparing in the use of materials. In this context, it refers to resources sourced in the form of planters, water, and other supporting structures.

Mulching: The process of covering the soil surface with a thin layer of organic material (plastic sheets may be used in colder areas) to retain soil moisture, increase fertility, and prevent weed growth. In this context, dry leaves or dry sugarcane fibres (called bagasse and easily available from sugarcane juice vendors) were used for mulching.

Probiotic: Refers to micro-organisms that contribute to the health of the human gut. In this context, an analogy is being drawn to compare microbes in cow-dung acting as probiotics for soil by improving its fertility.

Reciprocity: In this project, reciprocity refers to the perspective of developing a two-way relationship with plants based on care and empathy. We care for the plants and their extended environment, and one could argue that our care is validated through the harvest we receive in the form of vegetables and fruits.

Somaesthetics: is a field of study that emphasizes the role of sensory experience in aesthetic appreciation.

Sovereignty: In this context, sovereignty refers to the rights of food producers (farmers) and consumers to decide the mechanisms, policies and economics of food production in a sustainable manner. This includes the right to save seeds (instead of relying on agri-business companies to sell and control hybrid seeds) and becoming self-reliant.

Stewardship: Refers to the idea of being responsible and capable of caring for the local environment.

Trellis: An open architectural structure usually made of interwoven strips of wood to support the growth of climbers and creepers.

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To conclude

Urban spaces are generally seen as being far removed from Nature. This idea perpetuates the notion that cities exist separate from Nature, and urban human habitations can only have adverse impacts on the environment. Practices such as urban farming question this idea. Establishing a relationship with soil through the food we eat can be a powerful counter-narrative to dominant modes of production and consumption. A food farm provides a diversity of themes for discussion with students — these range from local geography and biology, to economics and history. In many cases, inter-relationships between these perspectives are more easily understood through one's experience with the farm, and the community that grows around it.

As a collaborative space, a terrace farm allows experiments with different forms of teaching, like peer learning and apprenticeship. It opens up multiple sensory modalities as pathways for learning. It can also demonstrate that grand slogans such as "Save the Earth!" may not be necessary in cultivating good environmental practices, because

in reality it is our **relationship** with Nature that needs saving. In fact, engaging with environmental issues in abstraction can result in inaction and desensitisation. By creating tangible connections, urban farms offer us the opportunity to restore a relationship of care, reciprocity, and respect for Nature. Hope is literally beneath our feet.

Key takeaways

- Tokenistic environmental activities and bleak scenarios of environmental degradation can leave students acutely aware of 'big' problems, but disempowered to bring about any transformation in their own lives.
- Being able to provide students with authentic experiences of engaging with the local environment is important in fostering an understanding of diverse ecological practices.
- Terrace farms offer one way of combining ideas of 'authentic participation' with possibilities of practice in land-scarce megacities.
- Working on the terrace farm:
  - introduced students to ways of perceiving the environment through senses of touch, smell and taste vs. just their eyes.
  - posed challenges that would often motivate students to come up with novel solutions.
  - offered students the impetus to widen the scope of their engagement to include composting, upcycling, reducing wastage of food, and growing plants in spaces outside school.
  - led students to reflect on more thoughts pertaining to the environment in general, and engage in community outreach efforts including seed and sapling exchange.
  - offered teachers the opportunity to experiment with different forms of teaching, like peer learning and apprenticeship.
- The involvement of schools in projects like terrace farming challenges the notion that urban human habitations can only have adverse impacts on the environment, while creating tangible connections that help restore a relationship of care, reciprocity, and respect for Nature.

Deborah Dutta is a PhD scholar at Homi Bhabha Centre for Science Education (HBCSE), Mumbai. Her research explores motivational processes underlying participation in environmental actions. Her specific focus is on urban farms as a site of community-practice. She can be contacted at deborah@hbcse.tifr.res.in.

Appendix 2 (Urban Farming Booklet)

Let's spill the beans!

A guide-book to start your urban food garden

What is an Urban Food Garden?

Urban farming is the practice of growing food within available areas in cities, or semi-urban areas. This practice has become increasingly popular in recent years for a variety of reasons ranging from concerns of food security, urban biodiversity, recreational spaces and so on. As urbanisation continues to grow at a rapid pace, urban farming can become a crucial tool in re-imagining our relationship with the immediate environment. On the other hand, increasingly erratic weather patterns, combined with excessive dependence on fossil fuels to grow and transport food over thousands of kilometres has made an average farmer's work extremely challenging. With the loss of traditional farming knowledge, and support of local community, they are forced to buy seeds, pesticides, and fertilizers, often falling into vicious cycles of debt when crops fail due to weather. The indiscriminate use of pesticides on large monocultures decreases the fertility of the soil, thereby requiring even more chemical input. The actual situation is more complicated due to influence of short-sighted policies, market forces and local politics. The result is a massive loss to local biodiversity, and negatively impacts the health of living beings.

Apart from easing the pressure on rural land and resources, urban farming practices offer a promising way to rebuild our connection to food, though local production and consumption. We can bring back the traditional farming knowledge, while exploring creative methods in smaller spaces. Farming can be a way to bring communities closer. Through food gardens, we can enrich the local biodiversity, and more importantly appreciate the joy and reciprocity of tending to the soil. Cities are conventionally seen as a source of numerous environmental issues. We can change that narrative, and it can all start with a handful of soil.

"The single greatest lesson the garden teaches is that our relationship to the planet need not be zero-sum, and that as long as the sun still shines and people still can plan and plant, think and do, we can, if we bother to try, find ways to provide for ourselves without diminishing the world."- Michael Pollan[1]

1 Pollan, Michael. *The omnivore's dilemma: the search for a perfect meal in a fast-food world.* Bloomsbury Publishing, 2009

2 Getting Started

This section will discuss what we need to consider when planning to grow a food-garden.

2.1 Space

Most urban-dwellers don't have the luxury of a backyard, but you will be surprised at how much can be grown even within modest spaces like a window-sill! You just need to tap into your creative side to design appropriate planters (discussed below), depending on the kind of building structure you choose. The following table illustrates the pros and cons of different sites. The amount of labour and time naturally increases with space, so it is advisable to start small and keep increasing the number of plants as you feel more confident.

Type	Pros	Cons
Window-Sill	Good place to grow creepers and green vegetables if adequate sunlight is available. Easy to manage	Cannot place bigger pots, as it can cause safety issues. Limited amount of vegetables, and greens can be grown.
Balcony or small terrace	Bigger containers can be used, after checking for waterproofing and weight bearing capacity of the floor (check with architects for this information). Planters can be moved around. Bigger plants can be grown.	Involves more work, depending on how many planters you would like to grow. Might include additional expenditure if waterproofing is not done.
Rooftops	Given load-bearing capacities, and adequate water-proofing, a large number of plants and even fruiting trees can be grown. Helps cool the building by reducing the amount of sunlight hitting the roof.	Access to rooftops can be restricted in apartment buildings. Need to ensure proper drainage of water. High-rises might be windy, and need additional structures to break the wind. Some shade may need to be built for plants sensitive to sunlight.
Backyards	Don't have to worry too much about soil and drainage. Trees can be grown without load-bearing considerations. You can also do pit-composting, and use the compost easily.	Can be more prone to pests. Access can be restricted. Can be vulnerable to water logging during monsoon, if situated in a low-lying area.

2.2 Sunlight

Most plants require about 4-6 hours of sunlight. So, balconies and rooftops have a better chance of getting ample sunlight. It is also important to keep in mind the orientation of the sun, as sunlight in the morning hours are preferred over the harsh afternoons. When making supports for climbers, the supports should face the direction receiving maximum sunlight, because the climbers will grow towards the light (this is called positive phototropism). The path of the Sun also changes with seasons due to the tilt of the Earth's axis (the highest arc being followed during Summer Solstice). So, it might be necessary to move planters accordingly. Some common shade tolerant plants include herbs such as Mint, Basil and Celery. Roots vegetables such as Beet, Onions, Garlic, Radish also do well in Partial shade.

2.3 Planters

There are many options available in the market, but you can be innovative and experiment with various materials to make planters. Generally, a good planter should allow for aeration, and drainage of excess water. It should also be made of materials which don't leach any harmful chemicals into the soil such as colour pigments from print material. Smaller plants, such as herbs can be grown in planters of depth 6-10 inches. Plants such Brinjal, Chilli, Tomatoes, Ladyfinger, and Capsicums require a 10 to 20 L capacity planter. In general, it is a good idea to plant fruiting crops in larger pots, since the plants will grow as per the space provided. Depending on the shape and size of the planter, multiple plants can also be grown together (This is called multi-cropping, and it is mutually beneficial for the plants. See p. 13 for details). The following table lists some common planters, along with its pros and cons. An Internet search will provide you many more ideas that people have used, ranging from grow bags, jute bags, old metal containers, rubber tyres, plain cardboard boxes, bags made out of old clothes and so on. Feel free to experiment and widely share your experiences!

Type	Pros	Cons
Clay Pots	Easily available; Provides natural aeration and drainage; Thick walls prevent soil from heating up.	Need regular watering; Heavy to move around, and add to the load on terraces etc
Plastic containers	Easily available; Light weight; Can be upcyled from discarded waste	Becomes brittle and prone to cracking under prolonged exposure to sunlight; Tends to heat up; contributes to plastic consumption if buying new containers.
Wooden containers	Aesthetically appealing. Larger containers can be designed to allow for mutli-cropping.	Can be difficult to sources (fruit sellers can have crates, especially during Mango season), can leach toxins if the wood is painted, chemically treated etc. Can be prone to termite infestation

Raised Beds (enclosed area of soil/compost that is higher than surrounding area). Variety of materials such as bricks, concrete blocks, wood, bamboo etc can be used to make the bed	Don't need much maintenance once constructed; Can plant bigger plants together. Easy to control soil conditions and look out for pests.	Can be laborious to construct initially (depends on building material).
Trellis/Support can be made from various materials such as coir ropes, thin strips of wood, nylon ropes etc.	Helps in growth of creepers and climbers such as gourds, plants with weak stems such as Tomato, cluster beans etc.	Can be a little cumbersome to make initially.

Tip: Germination of seeds can be supported by soaking them in water for a few hours/overnight before sowing. Don't keep them for too long though, else they will start decomposing! Also, Mucilaginous seeds (like the tiny jelly like seeds you see in a *Falooda* desert) such as basil, arugula, cress, mustard, chia and flax are seeds whose hull forms a gel sack around itself when exposed to water. Such seeds **should not** be pre-soaked. You will end up with a sticky mass that is difficult to seperate and sow.

2.4 Soil

Soil is a complex entity consisting of a mind-boggling variety of microbes, inorganic materials, and other organisms. It is a medium for plant growth, but also plays a vital role in storing Carbon that is captured by plants (through photosythesis) stored in its roots, stems etc, and finally decomposing into the soil. The soil organic matter (SOM) improves its fertility through better absorption of water and nutrients. SOM also reduces erosion, improves soil structure and contributes to a healthy soil ecosystem, which in turn provide plants with access to nutrients and minerals.

Ideally, the soil for growing plants should be loose, fertile, have a neutral pH level (~7; neither acidic not basic), and have good water retention. Ways to improve soil fertility include adding kitchen compost, making nutrient rich SOM called *Amrit-Mitti,* making Bio-char, adding green manure, mulching, and natural fertilisers. Each of these is described below:

(a) Kitchen compost: Food scraps are the easiest source of organic matter to enrich soil. They can be composted using various methods (Hot, Cold, Anaerobic, Vermi-compost). Basically,

composting is the process by which organic matter is broken into simpler constituents through micro-organisms or fungi under controlled conditions. Composting requires Carbon (dry/ brown biomass), Nitrogen (Greens/ fresh biomass), oxygen (if aerobic), and water. At home, use an aerated container with a lid (holes can be punched in the container or earthen pot), and simply layer food waste and dried leaves in a 1:2 ratio if the food waste is fresh. Sprinkle some red earth after every 2-3 layers. Turn the mixture every 10 days or so. When the container is full, keep it aside for about 15 days for the composting process to be complete. Compost has a dark, crumbly texture, and smells slightly sweet. Dairy and meat products should not be added, while composting in this way because they can attract rodents, and also upset the moisture balance in the compost pile, thus causing it to release ammonia-based compounds and create a stink. For more details, and starter kits, one can visit https://dailydump.org/. Steps involved in composting are also explained here: http://www.urbanleaves.org/2016/04/savealeaf-solution-2-composting.html. While, one can and should experiment with methods of composting, it is advisable to follow a tried and tested 'recipe' to begin with, so that the first cycle of success motivates you to try other options.

A popular method of anaerobic composting involves using a 'Bokashi' mixture. 'Bokashi' is a Japanese term meaning 'fermented organic matter'. It is basically an enriched microbial mixture that thrives in anaerobic conditions. In this process, the container should have some space for drainage of excess liquid from the bottom (this liquid can be diluted in the ratio 1:50 and added to plants). All food waste, including meat and dairy can be added. Every layer of the waste can be sprinkled with the Bokashi mix. The process of composting takes about 2 weeks, and the finished product has a pickled, sour smell. Often a whitish layer of mould can be seen on the top. This is a good indication. The compost can be buried in soil, and it will eventually turn black in a week. Bokashi mix can be commercially purchased, or even made at home (http://myecobin.in/media/how_to_make_your_own_bokashi_bran.pdf)

Vermicompost uses a variety of earthworms called 'red wrigglers' to break down organic waste. The food digested and excreted by the worms in the form of castings is used as compost. The main concerns here include maintaining the conditions optimum for the worms to grow. More details can be accessed here (https://www.farmingindia.in/vermicompost-preparation/)

(b) Amrit-Mitti: Amrit-Mitti (AM) is a method of soil-building through composting of dried and green biomass using a microbial-rich mixture of cow-dung, cow-urine and jaggery. The resulting soil is rich in nutrients, and organic carbon, thus lending it a dark, crumbly texture. AM weighs less compared to red soil, so is an ideal plant medium in apartment balconies, roof etc. A detailed description of AM, and steps involved in preparation can be accessed at

the Urban Leaves (a community farming group in Mumbai) website: http://purvita10.wixsite.com/urbanleaves/booklets. Steps are briefly summarised here:

- Collecting biomass: Dried foliage of trees in the city are an easily available source of biomass. Small twigs and stems can be used, but bulk material should comprise of leaves. Diversity of leaves from different trees is advisable. Some trees such the Rain Tree (very common in Mumbai) have waxy leaves which make it resistant to decomposition. The leaves must be thoroughly dried in the sun and roughly crushed under foot so fasten the process of composting.

- Amrit-Jal (AJ) preparation: AJ is composting accelarator made by mixing 1kg of cow-dung, 1L of cow-urine, 50 g of jaggery in 10 L of water. Ruminants like cows have some of the world's most potent microbes in their gut that allows them to digest tough biomass like grass and other plants. AJ is thus a microbial culture designed to multiply the microbe population in the cow-dung. Urine is rich in ammonia based compounds, proving the microbes with building materials to grow. Jaggery or other organic sweet sources act as food. AJ should be turned twice everyday to allow for aeration. On the 4^{th} day, AJ is ready to use. For direct application to plants, it needs to be diluted 10 times.

- Soaking of biomass: The dried and crushed biomass needs to be soaked in AJ overnight. The next day this mixture should be heaped in layers, adding a bit of topsoil, sand every layer. Foot-high heaps can be made. These heaps should be covered with AJ soaked gunnybags or baggasse to prevent release of moisture and heat.

-Keep for composting: The heap should be turned every week for aeration. Steam can be observed while turning the heap if it has been made well. White strands of fungi mycelium can be seen in later stages. The compost is usually ready in 30-40 days.

- Greening the compost: To improve the fertility of AM, a variety of locally available seeds are sown in it, and upper parts of these plants are pruned and added back to AM at 21 day intervals. After 63 days, the entire top portion of the plants can be chopped and added back to the AM, allowing the cuttings to decompose over a month. This process allows for a diversity of micro-nutrients and microbes to grow in the soil. It mimics a natural grassland grazing system in a limited space and time. The resulting AM is ready for use.

Tip: Sourcing cow-dung and urine can be a challenge in urban areas. However, many temples and local stables are good places to check. Dry cow-dung is available online by some organic farmers. Substitutes include buffalo, horse dung, but they can be more pungent. Any animal urine (including yours!) can be used as substitute as long as the creature is not on any heavy medication. For a crash course on interesting uses of human poo, and pee, see Saurabh Phadke's book: http://soarhub.in/wp-content/uploads/2009/10/POO.pdf

(c) Bio-char: Organic matter burnt slowly with restricted oxygen supply. This process results in creation of highly porous charcoal, which when added to soil helps it retain nutrients and water. If difficult to make due to lack of space, commercially available charcoal in local shops can be used.

(d) Mulch: Mulching is the process over covering the top soil with a thin layer or organic matter. This prevents soil from compaction due to heat, heavy rain, cold weather etc. Usually dried, crush leaves, bagasse (make friends with the neighbouring sugar cane seller!), straw (look out for Mango season: plenty ready to use crates with straw can be salvaged!) etc can be used. Cover crops, also known live mulch can be used. These include legume family species such as alfalfa, clover, mimosa, beans, peas etc.

(e) Natural fertilizers: Plants usually need macro-nutrients such as Nitrogen, Potassium and Phosphorus (NPK) for growth, though presence of trace elements like Boron, Magnesium, Zinc, Molybdenum etc is also important. Ground coffee, fresh grass cuttings is a good source of Nitrogen. Legumes planted in vicinity also fix Nitrogen. Phosphorus is especially needed for fruiting plants. Rock phosphate, and crushed bones (of animals or prawn shells) are a good source. Potassium is needed for proper leaf growth and disease resistance. Egg shells, epsom salt are a good source. Wood ash, the residue left after burning wood is also a rich source. It is alkaline in nature, so it alters the soil pH. Care should be taken to avoid over-use as it can cause other problems in the soil and plant growth.

Tip: Dilute Buttermilk (without any salt) is also a good source of microbes, and can be added to plants occasionally. An Internet search may provide many such home 'recipes' to improve soil fertility. It is advisable to test on one plant, and observe the results. Do share your experiences widely!

2.5 Seeds

In most cultures, seeds are rightfully considered sacred because it symbolizes the potential and fertility of life. A single seed can give rise to a million more, thus testifying to the natural abundance, given the right conditions in the environment. Hoidal (2015) writes, “Seeds carry the genetic keys to biodiversity and climate change resilience, and are records of cultural knowledge, reflecting historical breeding practices.” Saving seeds is a right, which has become increasingly threatened due to patents by agri-business companies that sell seeds, thereby making a farmer dependent on the company to continue growing crops. For more details, documentaries such as (https://www.seedthemovie.com/about/) can be seen. In India, NGOs such as BAIF, Navdanya, Vrihi, and Vanastree and several others as well as many individual small farmers are preserving seeds of grain (rice, millets, wheat etc.) , vegetable,

pulses, etc. So, when opting for seeds, it is advisable to choose organic, open pollinated seeds[2] , so that its mature fruits can be used to save seeds for the next sowing season. The sections below describe the steps from sowing to harvesting.

(a) Sowing: It is advisable to sow seeds in small containers with loose potting mix (coco-peat, which is composted coconut fibre, sand and compost) so that temperature, moisture and sunlight can be controlled during germination. Young saplings don't need harsh sunlight. Another advantage of sowing in smaller containers is that it prevents damage to the germinating seed by any pests in the soil. The small containers can be made from perforated plastic bags, tetra packs, dahi containers, egg shells and so on. It is also a good practice to label seeds using ice-sticks etc so that you can keep track of the germinated plants. Refer to the sowing calendar (p. 12) to find the suitable time for sowing a given seed.

(b) Transplanting: Once the plant sprouts a few leaves (the first two leaves are called false leaves; they are part of the embryo of the seed), it can be transferred into a bigger pot. This should be done carefully, preferably in the evenings so that the plant gets time to adjust before facing harsh sunlight. While transplanting, care should be taken to avoid damaging the roots. Some wood-ash can be added to prevent any fungal infection while the plant roots adjust to the new soil medium.

(c) Harvesting: Seeing fruits grow is an indescribable joy. Harvesting for consumption should be done when the fruit is mature, but not over-ripe. Most can be identified visually, or by touch. For others, there are different indications when the vegetable/ fruit is ready for harvesting. For instance, radish is ready for harvesting when some part of it can be seen above the soil. Turmeric and Ginger, which have a maturing period of around 10 months are watered very less in the last month. They are ready to be harvested when the leaves look dried. You can share more such observations as you grow your vegetables.

(d) Saving seeds: This topic is very plant-specific, and traditional farmers would literally pass on wisdom on the ages regarding this practice. However, general guidelines include selecting a healthy plant with minimal stress and disease for seed-saving. The fruit of this plant should be allowed to ripen and mature completely. Seeds from plants such as tomato, brinjal, gourds etc are 'wet' and need to be separated from the pulp. Take water in a bowl and rinse the seeds. Healthy seeds sink to the bottom. After several cycles of rinsing, pat dry with cloth. Spread seeds on butter paper, or ceramic/ glass plate and keep them for drying. Store the dried seeds in a dry, cool, dark place. Seeds of tomatoes and some gourds are stored best after fermentation. These seeds should be rinsed AFTER the process. Seeds of cruciferous vegetables (radish, cabbage, cauliflower, mustard) can be saved by collecting dried pods of the plant. Herbs such as Basil, Mint, Spearmint etc can be propagated from cuttings. People

2 Open-pollinated seeds are those which are pollinated naturally through pollinators, wind etc for many generations. Such plants are nearly identical to the parent plant.

serious about seed-saving take a lot of care to ensure that purity of line is maintained by ensuring that cross-pollination does not take place. More details can be accessed here: http://203.64.245.61/web_docs/manuals/save-your-own-veg-seed.pdf

Tip: Coriander seeds should be sown after slightly crushing the seeds. Whole seeds rarely germinate.

Seed Sovereignty

Till the first half of the 20th century, seeds were saved and freely shared among farmers and public sectors. This free exchange also allowed for traditions, knowledge and folk wisdom to be passed on for generations. However, in the recent past, a few large multinational chemical companies are trying to control the distribution of various seeds. This shift has mostly been catalysed through technological and market forces which allowed private companies to patent hybrid and genetically modified seeds. A patent results in any use of the patented product as requiring some form of payment to the company. Using commercial seeds can also adversely affect diversity of crops being grown. Once seeds are seen as a commercial product, traditional knowledge of saving diverse seeds is also lost. To counter this trend, many farmers and activists are actively participating in saving seeds, and protesting against seed companies. According to Shiva (2012) Seed sovereignty "includes the farmer's rights to save, breed and exchange seeds, to have access to diverse open source seeds which can be saved –and which are not patented, genetically modified, owned or controlled by emerging seed giants. It is based on reclaiming seeds and biodiversity as commons and public good".

2.6 Water

Watering plants can be like a Zen practice; Seemingly easy, yet ridiculously hard to master. Too little can stunt plant growth, and too much can cause root rot, fungal infections etc. Usually, it is a good practice to check the soil by sticking your finger in it to check for moisture. If it feels dry, water the plants. Early morning, or evenings are a good time to water the plants since they can absorb it without too much evaporation. Various methods to water plants include drip-irrigation, self-watering systems. Exploring rain-water harvesting, and recycling of grey water (waste water from kitchen sinks, showers, washing machines etc if eco-friendly washing materials such as soap-nuts are used) for watering are good practices to save water.

3 Digging deeper

This part will discuss how to take care of plants and nurture the local ecosystem through some common practices

3.1 Tilling

Occasional tilling of larger pots may be needed if you feel the soil seems hard and clumpy. In this case, areas near the main stem should be avoided. Use a prong or shovel to dig slightly and loosen the soil. Top the area with mulch, sprinkle some wood ash, and water slightly.

3.2 Pruning

Pruning refers to removal of parts of plant that might consist dead, infected parts, or overgrown parts. Pruning can result in better growth and yield of plants. However, this requires some expertise because doing it incorrectly can injure the plant and be counter-productive. It is safer to remove infected parts of a plant under pest attack to prevent further disease. While handing a healthy plant, however, it is better to consult more experienced farmers. 'Pinching' refers to removal of immature fruit or buds using fingers. This is usually done for tomatoes, and Basil, Amaranth etc to encourage growth. For more information please see: https://www.fix.com/blog/why-you-should-prune-vegetable-plants/

3.3 Nurturing local biodiversity

In general, growing a diversity of plants provides better pest control, since different plants can act as host for many kinds of insects which have predator-prey relationship. A variety of insects also attract lizards, and birds which also help in control pests. Flowering plants attract pollinators, such as butterflies and bees, thus also providing them a habitat within the city! Plant diversity can be achieved at various levels: 1) Varieties of the same plant (such round brinjal, long brinjal, purple and green etc) can be grown (but not together) 2) Complementary planting of different species, generally combining tall, short plants; fibrous root, tap roots; deep roots, shallow roots; climbers, ground plants. More details on companion planting can be accessed on p. 13.

4 When something ain't right; Keep calm and compost!

In this section, we will delve into some common issues that one can face while growing edibles, and possible solutions for them.

4.1 Composting woes

In the beginning, one may run into a number of problems while composting. Most of them can be easily resolved, so no need to panic! Following are the common issues and solutions while doing aerobic kitchen composting.

Symptom	**Cause**	**Solution**
Compost pile not heated	Not enough 'wet' greens	Add fresh kitchen waste

Too wet	Excess greens; Also fruit peels of mango, melon etc have a lot of water content. Grass clippings also release moisture	Shred waste and add in thin layers, alternating with 'browns' such as dry straw, dried leaves etc (avoid chemically treated paper, sawdust etc)
Too wet	Not enough aeration; materials are too soggy	Turn the pile, and add more 'browns'
Too dry	Excess 'brown' and less 'green'	Can sprinkle some water; Add more greens
Moist but not composting	Uneven distribution of materials	Turn the pile. Ensure it has holes on the side, but the top is covered in order to maintain microbial activity
Bad odour	Too wet, and unevenly distributed. Clumps of waste start decomposing in anaerobic conditions, and release sulphur, ammonia based compounds	Add more 'browns', can add some dry soil. Turn the pile.
Rodents, fruit flies, maggots	Wet waste uncovered, too soggy so releasing smell that attracts these creatures.	Keep the pile covered. Top maost laye should be of 'browns'
Too many ants	The pile may be too dry	Wet the pile, and turn it.

4.2 Pest attack

'Pest' is not a biological category. It a cultural term to describe any creature that is harmful to a plant we wish to grow. In a healthy ecosystem, a dynamic predator-prey relationship ensures that any potential pest population is under control. Soil is another key factor contributing to plant's health, thus helping it develop resistance to disease and attacks. In the event of a pest infestation, one should always give some time for observation. More often than not, the plant eventually recovers, and is then resistant to further attacks. It is like waiting for a person to naturally fight a fever, rather than loading them with antibiotics which can have adverse effects. Similarly, indiscriminate use of pesticides, organic or chemical can also result in the pest developing resistance to it. So, use natural pesticides, sparingly, only after other methods like washing the infected parts, pruning etc doesn't seem to work. Some common pests, and treatments are described below

Pest/ Disease	Plants affected	Symptoms	Treatment
Aphids: Pear shaped brown, yellow insects. Also, called plant lice. They grow rapidly. A	Almost all plants	Curling, yellowing of leaves; stunted growth	Wasps and ladybugs are natural predators. Dilute Soap nut solution can be applied

sugary secretion from their bodies attracts other insects, especially ants who then protect these colonies!			to affected areas.
Ants	More of a partner-in-crime with aphids. They don't do any damage to plants themselves		Usually no treatment is needed. Soil might be too dry, in which case some water and ash can be added.
Beetles: Vary in size and shape.	Feed on a variety of crops	Holes in leaves	Pick by hand, if not too many. Garlic, Tobacco sprays can be used.
Leaf miner: It is the larva of insects like moths, beetles and flies. They feed on the inner part of leaves	Tomato, Okra, Brinjal, Cucumber.	Whitish, squiggly lines can be seen on the leaves. Leaves dry and curl up thereafter. Serious infestation causes less fruiting	Larva is shielded inside the leaf, so natural pesticides are not effective. Remove infected parts. Natural predators usually eat them.
Mildew: Fungal infestation due to damp conditions or overgrowth	Almost all plants. Melons, Squash, Corn, Cucumber are more prone.	White, powdery patches can be seen on leaves and stems	Organic fungicide. Remove infected part
Slugs and snails: Soft bodied pests	Cabbage, Carrot, Lettuce are more prone. They feed on everything though	Slime trails and half eaten plants	Pick by hand
White fly: Carrier of plant diseases. Lays eggs on underside of leaves	Brinjal, Pepper, Tomatoes	Stunted plant growth, sticky patches on leaves	Neem oil is effective

Some recipes for making organic pesticides are as follows:

- Tomato/ Potato spray: Tomato/ Potato is part of nightshade family which contains toxic compounds in the form of alkaloids in their leaves. The spray made out soaked and boiled leaves is a good insecticide and fungicide. To make the spray soak two cups of chopped tomato leaves in two cups of warm water. Leave overnight and strain the next day. Dilute the liquid with another cup of water. This solution is ready to be used as a spray. The solution is toxic to humans, so handle it carefully.

- Neem oil spray: The bitter flavour deters insects. Can be made from crushed neem leaves or

oil extract from seeds. Commercially available too.

-Soap nut spray: The soapy surface prevent aphids from attacking the plant. Soak 6-7 soap nuts in 1L of water for 15 min and use.

Other insecticides can similarly be made from Tobacco Leaves, Dilute cow-urine, Garlic pods, Chillies and so on.

5 The next step – From 'me' to 'we'

5.1 Bringing communities together

In the end, farming is about relationships. It is an embodied way of understanding the way in which connections between the air, soil, water, sun, plant, and other creatures nourish our life. It can also be a powerful, and effective way to adapt to a changing climate. While most environmental actions are imagined on very small (individual) or a very large (countries, governments) scale, more often than not, grassroots initiatives can result in long-term, impactful changes in the society through creating cultural norms, and practices. Environmental activist, Rob Hopkins writes, “If we wait for the governments, it'll be too little, too late; if we act as individuals, it'll be too little; but if we act as communities, it might just be enough, just in time.” It is more fun too! We share our experiences, knowledge, stories with people through participating in community projects. Several cities in India have vibrant community farms, where one can volunteer (see p.15 for details). School spaces can also be opened up for farming related activities. Public parks, and abandoned areas have been used widely across many cities in US and Europe. Indian cities are seeing a growing trend too. Not all revolutions needy to be bloody wars, some can start with the faintest crackle of a seed emerging from the earth.

6 References and Supplementary information

6.1 Sowing Calendar (approximate since weather varies with local geography)

Month	North India	South India
January	Brinjal	Lettuce, Spinach, Gourds, Melons, Radish, Carrot, Onion, Tomato,Okra, Brinjal, Bean
February	Applegourd, Bittergourd, Bottle gourd, Cucumber, French Beans, Okra, Sponge, Gourd, Watermelon, Spinach	Same as Jan
March	Same as Feb	Amaranthus, Coriander, Gourds, Beans, Melons, Spinach, Okra
April	Capsicum	Onion, Amaranthus, Coriander, Gourds, Okra, Chilly, Corn
May	Onion, Pepper, Brinjal, Ginger, Turmeric, Potato	Okra, Onion, Chilly, Ginger, Turmeric, Potato
June	All gourds, Brinjal, Cucumber, Cauliflower (Early), Okra, Onion, Sem, Tomato,Pepper, groundnut	Gourds, Chilli, Potato, Brinjal Almost all vegetables, groundnut
July	All gourds, Cucumber, Okra, Papdi, Tomato	Same as June
August	Carrot, Cauliflower, Radish, Tomato	Carrot, Cauliflower, Beans, Beet
September	Cabbage, Carrot, Cauliflower, Peas, Radish, Tomato, Lettuce	Cauliflower, Cucumber, Onion,Peas,Spinach
October	Beet, Brinjal, Cabbage, Cauliflower, Lettuce, Peas, Radish, Spinach, Turnip	Brinjal,Cabbage, Capsicum,Cucumber, Beans, Peas, Spinach, Turnip, Watermelon
November	Turnip, Tomato, Radish, Pepper, Peas, Beet	Beet, Eggplant, Cabbage, Carrot, Beans, Lettuce, Melon, Okra, Turnip
December	Tomato	Lettuce, Pumpkin, Watermelon, Muskmelon, Ash gourd, Ridge gourd, Bitter gourd, Bottle gourd, Cucumber, Chilly, Cabbage

Source: https://www.greenmylife.in/sowing-charts/

6.2 Companion plants

Plant	Preferred pairing	To be avoided with
Basil	Tomato, Pepper, Asparagus, Petunias, Bean	
Beet	Onions	
Cabbage	Geranium, Dill, Alliums, Rosemary	Mustard, Tomato, Pepper, Strawberry, and Pole/Runner Bean
Capsicum	Red Pepper, Eggplant, Basil, Carrot, Tomato, Onion, Leek	
Cauliflower	Bean, Celery, Dill	Pea, Potato, Tomato
Corn	Bean, any Squash	Tomato, Celery
Mint	Capsicum, Lettuce, Potato, tomato, Cabbage,	
Marigold	Any plant; deters pest attack, as pest preferentially attack Marigold rather than the edible plant	
Peas	Beans	Garlic
Potato	Horseradish	Sunflower, Tomato, Cucumber
Radish	Lettuce, Melon, Spinach, Sweet Corn, Tomato, Carrot, Fr Bean, Cabbage	
Spinach	Potato, Radish, Strawberry, Tomato, Cabbage, Celery, Fruit Trees, Pea, Bean	Garlic
Tomato	Basil, Oregano, Parsley, Carrot, Marigold, Alliums, Celery, Geranium, Petunias, Nasturtium, Borage	Cruciferous vegetables, Dill, Potatoes
Garlic	Lettuce, Celery, Beetroot, Carrot, Fruit trees, Cucumber, Tomato, Capsicum Bell Pepper.	Spinach, Beans, Peas

Adapted from: http://www.sustainable-gardening-tips.com/Vegetable-Garden-Layout.html

6.3 Useful sources for further reading

Ladner, P. (2011). *The urban food revolution: Changing the way we feed cities*. New Society Publishers.

Tracey, D. (2011). *Urban agriculture: ideas and designs for the new food revolution*. New Society Publishers.

Sources for conducting farming projects in schools: https://edibleschoolyard.org/

Alvares, C. (2009). *Organic Farming Sourcebook*. Other India Press (Available at: https://www.twn.my/title2/books/organic.farming.sourcebook.htm)

Some Urban farms in India (https://medium.com/@VikramSarbajna/urban-farming-in-india-is-it-serious-business-b1acb8a15b38)

City Farming groups (http://cityfarmer.info/category/india/)

Bookstore for reading on various environment-related topics, especially in the Indian context (http://earthcarebooks.com/)

Sources for farming camps and related articles: https://www.ecologise.in/

Network of Organic farmers in India: http://ofai.org/

Appendix 3: Data Collection Tools

3.1 Semi-structured interview questions posed to adult volunteers

1. Initial queries about age, educational background and current occupation

2. When and why did you join Urban Leaves (UL)?

3. Do you grow some plants at your home too? If so, which ones?

4. Where do get the seeds or saplings from? Any particular reasons?

5. Do you think volunteering at UL has helped you in some ways or contributed to a change in lifestyle? If so, how?
   -- Becoming a co-ordinator; how do you feel? How is it different from being a volunteer?

6. UL emphasizes using *amrut mitti*. How is it different from other kinds of manure and soil?

7. Do you recall any incident on the farm w.r.t plants for which there was no obvious cause? How was it tackled?

8. Have you talked to any of your friends or family about UL? If so, what has generally been their reaction?

9. Mumbai is known for severe shortage of space. In this situation, what predictions would you make for the idea of urban farming and why?

10. Would you recommend farming as a co-curricular activity in schools? If so, why?

3.2 Pre-intervention questionnaire posed to students

Hi! Below are some questions which I would like you to answer. There are no right or wrong answers to these questions so please don't copy your neighbor's response! :)

These are just meant to understand your thoughts, so go ahead and write whatever you feel as an answer to each question. Thank you!

1. What comes to your mind when you think about nature?

2. Do you think nature needs to be protected? If so, why?

3. List all the environmental issues you think are important and require immediate attention.

4. Have you ever participated in any environmental activity? If yes, what did you do?

5. What do you understand by waste? Can you give some examples?

6. Do you believe that you are involved in environmental degradation in any way? If yes, in what ways?

7. Do you believe that you are involved in environmental conservation in any way?If yes, in what ways?

8. Do you have plants at home? If No, then skip this question.

- Can you name them?
- Who takes care of them?

9. You may have heard of the fire that broke in the Deonar dumping ground on 28th January 2016. The intense smoke caused lot of respiratory problems. You also have a dumping ground next to your school. It is likely that a similar fire may occur in the Mulund dumping ground too. Imagine you are the Chief Minister of Maharashtra. What solution would you suggest to the dumping ground problem? Following are some points to consider

- Nearby citizens want the dumping ground to be closed permanently. In that case where would the garbage generated daily go? About 2600 metric tonnes of garbage is dumped at Mulund alone!

-Many poor people are dependent on the dumping ground for their livelihood by segregating and selling waste dumped at the site. What would they do if the the dumping ground is closed?

- Even if the dumping ground is closed, what will happen to the garbage already lying at the landfill?

3.3 Semi-structured interview questions posed to selected students (post-intervention)

1. What are the different activities you have done on the farm?

2. Is there any activity you liked doing the most? Why?

3. Is there any activity you found boring or difficult?

4. Is there any incident at the farm you remember very clearly? Why?

5. Is there anything new that you learnt while working on the farm?

6. What are the things you learned on the farm? Are any of these activities new to you? How so?

7. Were there opportunities / incidents where you taught something to others on the farm? What are those opportunities?

8. Have you spoken your work on the farm with anyone back at home?

9. Have you tried doing something at home after working here?

10. Given a chance to have your own balcony/terrace farm, can you name some plants that you would you like to grow?

11. We have been saving seeds for some plants on the farm. Do you remember which ones. Why do you think we have been doing this? Is it important?

12. Imagine I am the president of the apt. building you live in, and you want to convince me that terrace farming is good idea to start in the apt. What would you tell me?

3.4 Post-intervention questionnaire posed to students

Wow! Time flies! I did not realise so many months have passed! I would really like it, if

you spend some time reflecting on your experiences, and answer the following questions based on your own thoughts. There is obviously no right or wrong answer! :) Happy writing!

1) Is there anything on the farms that you experienced (saw, heard, smelt, touched) for the first time? Can you list them?

2) What did you like doing the most during the farming activities? Why did you like it?

3) Did you feel this activity brought any change in any of your friends working with you? If so, can you describe what changes you saw?

4) Did participating in this activity lead you to think differently about food? If so, in what way?

5) Did you try anything at home while doing farming in the school? If so, what did you do?

6) Is there anything you would like to do after your experience of farming at school? If so, What would you like to do?

7) After this farming experience has you definition of waste changed? Can you give some examples?

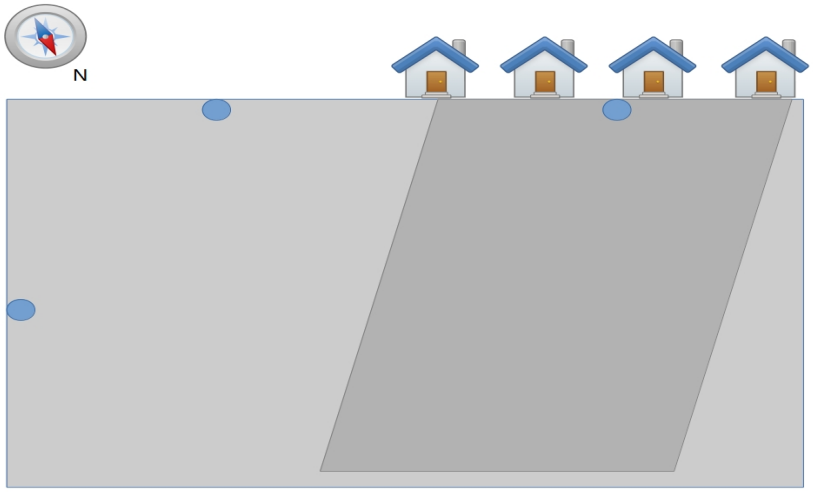
9) How did you feel after visiting another school doing farming?

10) Is there anything new that you got to see and learn there?

11) Can you think of some things we could do to improve the farm next year? (You can also draw any ideas that you have)

12)Tina has a terrace as shown below. She wants to start an urban farm but wants to know what all she should keep in mind before starting. She has told you that part of the terrace is shaded by nearby buildings, and she has three drainage points (marked with a circle). Can you list some points that could help her? Example: What will she need? How

can she design her beds? What plants she could typically grow? Any other tips. Also, give your reasons to help her understand better. (You can draw on the map if you wish)



3.5 Semi-structured interview questions for teachers

Part 1: Background

1) You have been teaching for how many years?

2) What subjects do you teach?

3) How did you come to be in charge of the environmental activities in school?

Part 2: Understanding their views about Urban Farming

4) When I approached the school for the terrace farming activity, what were your expectations?

5) What do you think students are learning from these activities?

6) Have you had any informal discussions with them? Elaborate.
- Have you seen any changes in them over the period they have worked on the farm?
- Any specific incidents

7) In what way is this activity useful for students? Examples using students?
- What do you feel is the most important thing about this activity?
- What can be excluded?
- In what way is this different from learning about gardening from a textbook?

8) Do you see this as environmental activity? Why?

9) Can any connections be built with different textbook chapters or curriculum? Example?

10) Do see this activity continuing in the next couple of years? How do you see it shaping up?

11) Have you had any discussions with any other teachers in the school? Did it lead to anything on their part?

12) Do you think teachers need some prior training to teach urban farming? Explain?

- Would you recommend this project to other schools? Why?

- If some other school teacher were to start a similar project, what would you tell them?

-In case a school is not able to have this kind of activity at all, how could a teacher teach these things to the students?

13) What kind of learning resources/info would you recommend one can create for other teachers interested in such activities?

Part 3: Effects on personal life and wider actions

14) Did you have any prior interests in growing vegetables? (If yes, probe how come?)

15) Is there anything from this project that has impacted you at a personal level?

16) Do you think there is a potential for this to be taken up within residential complexes as well? Probe yes or no response.

17) Have you spoken to friends or family about this project? What did you say? What has been their response?

3.6 Semi-structured interview questions for parents

Part 1: Background

1) What is your current occupation?

Part 2: Their observations and reflections about the children

1) Has your child spoken to you about what they do at the terrace farm?
- (If 'yes') what did they discuss with you?

2) Have you seen any changes in them in terms of general behaviour/ lifestyle? Could you elaborate with any example?

3) Did they want to try out anything at home after their experiences here? (If yes) Did that motivate you to try anything more?

4) Do you think this has been a useful exposure for the children? Why?

5) Have you discussed this with any of your neighbours, friends or relatives?

Part 3: Their personal reflections

1) Would you like to get involved in a similar project in your neighbourhood?

2) Do you think such projects taken up on a wider scale could have any impact?