Doing to being
Developing pro-environmental motivations through urban farming in schools

Synopsis

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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 propose a general model of the way motivation merges from embodied interaction 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 lead 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 develoepd 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

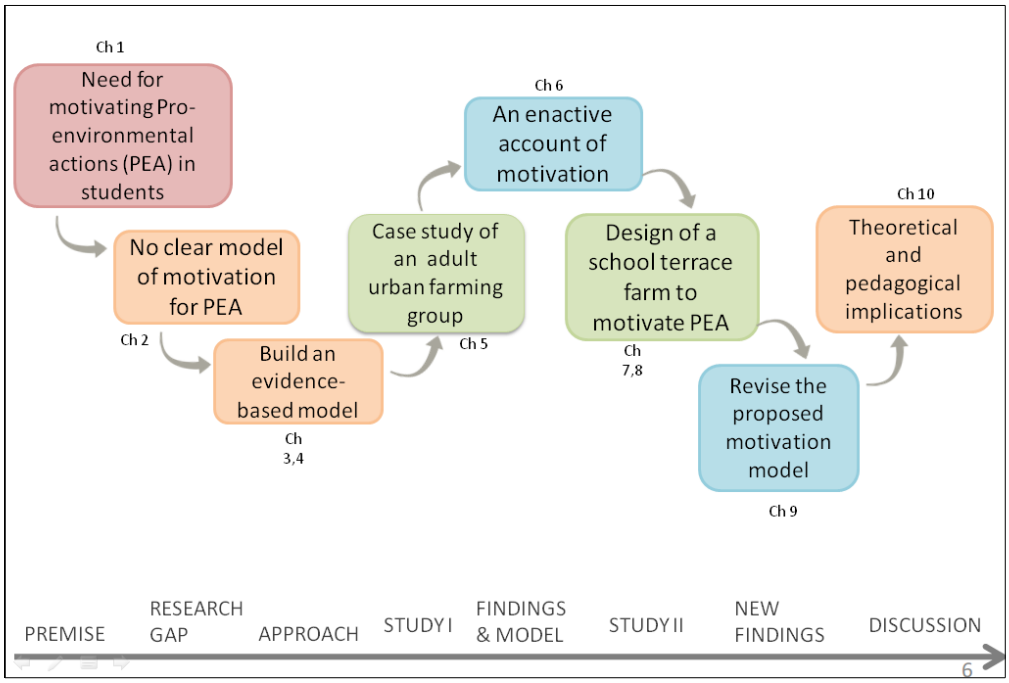

Figure 1: Thesis at a glance

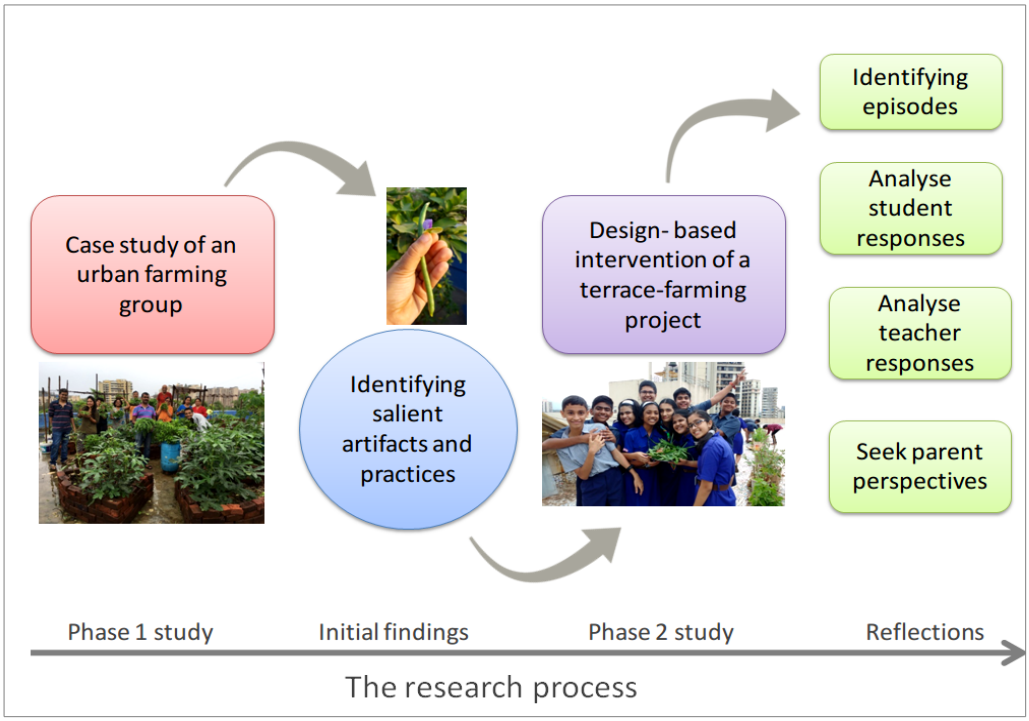
Case study of an urban farming group
Identifying salient artifacts and practices
Design- based intervention of a terrace-farming project
Identifying episodes
Analyse student responses
Analyse teacher responses
Seek parent perspectives
Phase 1 study
Initial findings
Phase 2 study
Reflections
The research process

Figure 2: Overview of the research trajectoryAnalytical Index of Chapters

Ch 1: Premise and motivation

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.

Publications based on the thesis

I) Peer-reviewed papers

- Date, G., **Dutta, D.**, Chandrasekharan, S. (accepted). *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.

Table 1 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.

Chapter 1: Introduction

A key mandate of environmental education (EE) is seeding pro-environmental actions in society, so that humanity can move to a sustainable future. However, current models of EE seeks to provide students just information on the environment, with the assumption that this information will lead to pro-environmental actions (PEAs) and motivation. This information-based approach stems from the early association of EE with Science Education and influential theories of cognition as information-processing. Further, current EE focuses on individual actions – rather than community initiatives – and this has limited the development of interventions that focus on collective action to support the environment.

1.1 Premise and Motivation

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. The failure in part 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 regarding their definition and solution, 'wicked problems'.

Given this complexity, a model of education based on the assumption that providing information is enough, and the 'patching' of environmental topics to existing disciplinary content, is not the right approach to EE. This approach can do little to engage with the complexity of problems, or develop skills required to act in competent ways (Ashley, 2000; Bonnett, 2013).

1.2 Critique of information-based approaches

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 does 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 (such as impact of deforestation on climate change, use of fossil fuels on global warming, ocean acidification, use of pesticides on insect population), which precludes immediate feedback. The connections between individual actions and the global scale of issues are difficult to understand. Further, the complexity related to economic inequity leads to a range of interpretations and causal attributions.

b) Cognitive dissonance: Engaging in pro-environmental behaviors requires going against the flow of established practices, which exerts a cognitive load on the individual, who has to disengage from 'default' behaviors that run on auto-pilot, 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).

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. This issue becomes even more complex when the resources are invisible (Chandrasekharan & Tovey, 2012) and there is no feedback

or perceptible impact from one's actions.

1.3 Need for action-oriented approaches and evidence-based theory

Recognising the interdependency of social, psychological and cultural factors in the problem of sustainability, 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. Various scholars have argued that there is a need for theory that accounts for peoples' ways of thinking and valuing different practices, and the way action is connected to these, to help in designing impactful interventions.

One way to develop such theory is to study pro-environmental grassroots practices, which exist in many communities. While many such initiatives have been covered by media, the design process of such initiatives haven't been studied with the aim of developing theory and 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-based interactions. An understanding and appreciation of the social and cognitive mechanisms underlying such initiatives could help seed similar interventions as part of EE.

1.4 Focus of the thesis

In order to develop alternatives to information based EE, I have sought to develop insights based on different community-level interventions that have had a transformative effect on environment-related issues. 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?

Based on the study of community-level initiatives, I identified community-farming as a powerful tool

to engage and support pro-environmental actions. More specifically, I examined how individuals become motivated to participate in environmental activities through farming, even if they begin farming with pragmatic considerations. I then used these initial findings to design an educational intervention based on a school terrace farm, and analysed how this design helped seed PEA in students and teachers.

Chapter 2: Literature Review

A review of prominent action-centered approaches to EE, and the contexts of their implementation, 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. I also reviewed seminal research on motivation and cognition, which highlighted a gap in the process-level understanding of the way pro-environmental actions emerge from related practices.

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 the main aim of EE.

Within critical approaches, there have been efforts to move away from science-based information paradigms, and educators now emphasize more explicitly the role of values 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. Two other major paradigms are outlined below:

- *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. 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. 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).

- *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. OE later became an integral part of EE, after studies (D'Amato & Krasny, 2011; Dunlap & Heffernan, 1975; Larson, Whiting, & Green, 2011) that 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.

Overall, 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. Studies suggest a significant confluence of affective and motivational aspects in the construction of transformative experiences. However, theory-driven models that seek to understand, analyse and, design EE practices, particularly ones that constitute the varied qualities of direct experience, is however, scarce in the EE literature (Chawla, 2008; Reid, Payne, & Cutter-Mackenzie, 2010).

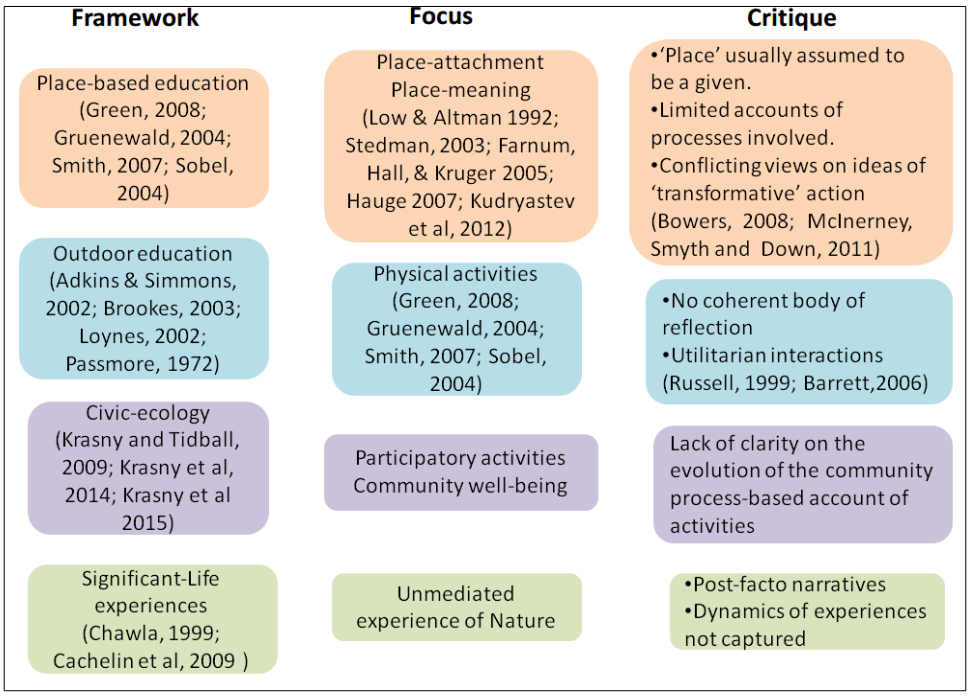

Fig 2.1: Overview of EE frameworks that emphasize action

2.2 Motivational accounts of PEA

Motivation is closely linked to action, and an important area of research in EE seeks to understand motivational processes that lead people to take pro-active roles in environmental issues. 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 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, values and 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. The following brief review captures some of the major motivational frameworks proposed to describe PEAs:

- *Cost/Benefit approach to PEA*

Some of the dominant models to understand pro-environmental actions assume that behavioural outcomes stem from rational evaluation of available choices. The behaviour selected is considered to confer maximum benefits when the costs are lowest. However, such models have been criticised for their 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).

- *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. 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 et al., 1999; Hopper & Nielsen, 1991). 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.

- *Affective motives in PEA*

Research has also explored the role of emotions in PEA. Emotional needs are seen as playing a dual role in motivated behaviour; First, it can serve to reinforce an executed behaviour. Secondly, it can substantially dampen or arouse a desired behavioural outcome (McClelland, 1987). 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, and resist the easier default options that are available.

- *Integrative models*

Recent work has sought to account for the effects of contextual variables, by acknowledging multiple motives to be active at a given time, and modeling particular behaviours as resulting from interactions between different motivations and situational variables. 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. However, the process by which such goals are formed and sustained is not examined. To some extent, the role of the environment has been considered by Kaplan and Kaplan (2008, 2009), who explore the role of environmental variables. In the Reasonable Person Model, they argue that people are inherently motivated to accrue meaning from their surroundings, and environments need to be designed such that people are able to process and act on the available information. What constitutes supportive environmental structures, and how they interact with the human psyche to generate meaningful action, is not understood, and these issues are currently under active investigation.

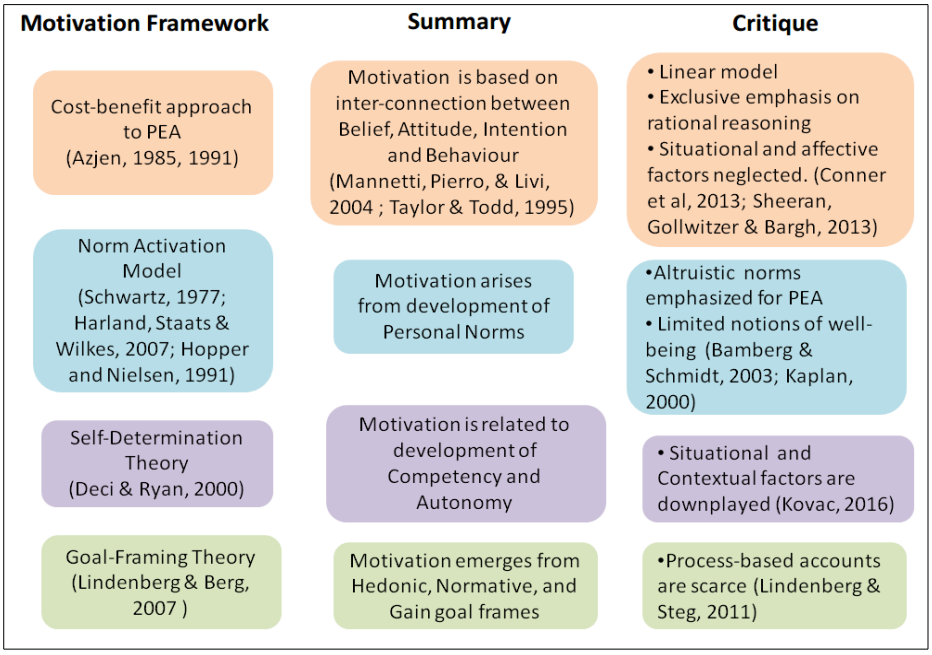

Fig 2.2: Overview of psychological theories of motivation

2.3 Exploring motivation as an outcome of dynamic relations

A common thread connecting the various frameworks described above is the classical information-processing model of cognition, where it is assumed that: a) the mind extracts information from the environment, including social context b) various aspects of the environment have an information-based linkage 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. In contrast, arguments supporting the primacy of body-based experiences (in developing pro-environmental sensibilities) attempt to understand the environment as playing a *constitutive* role in psychological functioning. These arguments are 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 dynamic view of the role of environment in cognition 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, 2018). Similar interaction-based models might provide more insight into the motivational processes involved in PEA.

2.4 Research gap

In summary, this broad review of literature across various theories of EE and Motivation indicate that contemporary models of PEA among individuals recognise the importance of direct experience and engagement with the immediate environment as important factors. However, what constitutes a salient direct 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, and the model of rational deliberation generating actions on the environment. 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. These trends point towards the following research gaps: 1) The importance of salient direct experiences is acknowledged in EE literature, but linkages between PEA and community actions have not been explored in sufficient detail. 2) In the psychology literature, the interaction-based generation of PEA is not adequately addressed (as it is often assumed to stem from ‘static’ factors; situational determinants are downplayed) . 3) There are very few implementation studies and empirical, process-based accounts

Chapter 3: Research Design

I outline the rationale for choosing farming as a domain to explore connections between salient experiences, motivation and PEA. The context of urban farming in particular, along with its potential to address several environmental issues, are discussed. The questions driving my research, and the broad approach followed, are elaborated.

3.1 Reaffirming the 'culture' of agriculture

It is not a coincidence that most community-level pro-environmental practices 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. 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 input-output parameters. Given the deteriorating ecological situation, many efforts to reclaim a positive relationship with the environment have begun by reverting to the traditional practices of farming.

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. 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 allow 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 10 people expected to reside in cities by 2050 (UN 2002, UNICEF, 2012). 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). Given this 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. Milton Mclaren (2009) remarks that EE has had a peculiar blind-spot in acknowledging and developing programmes within urban scenarios. 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 a separation between human activities and natural systems, and devalue the urban environments in which many students live.

3.3 Urban farming as a site of practice

Food security and production are intimately connected with urbanisation, and related ecological issues, but these connections are not readily visible. 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. 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.

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 trend is accompanied by a revival of, and search for, ecologically-sound methods of farming that were embedded in traditional practices. The potential of local urban food systems in promoting socio-cultural and ecological sustainability is also a growing field of research (Thorp & Townsend 2001; Krasny & Tidball 2009; Turner, Henryks & Pearson, 2011).

3.4 The 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. Given the various affordances of farming discussed in the previous sections, farming was chosen as a candidate domain to understand how PEA could be motivated. The core question guiding this work was: *how do individuals become motivated to participate in environmental activities?* This question was investigated through the study of volunteers at an urban farm.

The second phase of my research applied the findings from studying the volunteers at the farm. I designed a school-level interventions that sought to motivate students to take up environment-oriented actions. This evidence-based intervention approach was inspired by Nersessian et al. (2003, 2006,

2015) who studied scientific practices in interdisciplinary laboratories (artifacts-practice interactions) to develop interdisciplinary classroom practices.

The overall operationalisation of my research questions had 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 student 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

The method of participant-observation based case-study is presented 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.

4.1 Research Questions

Based on the review of literature, the following broad research questions guided my work:

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

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 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 and 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.

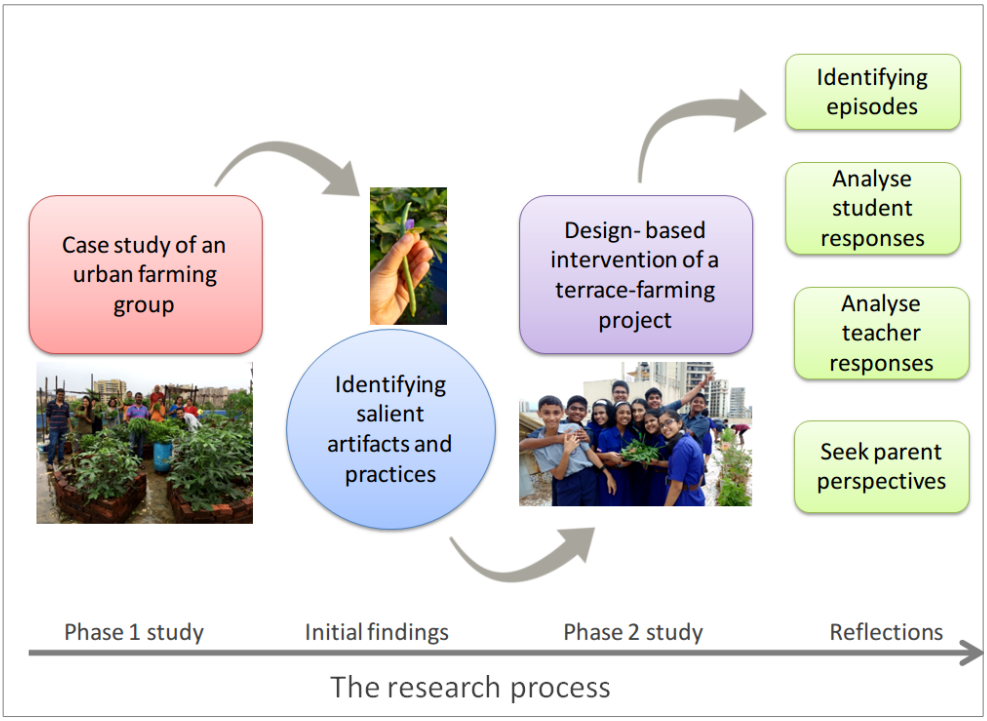

Figure 4.1: Overview of the research trajectory

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 (2009) argues 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).

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

4.2.1 Description of study-site (Phase 1)

Urban Greens (UG) (pseudonyms have been used unless specified otherwise) is a city farming volunteer group co-founded by Pushpa, a catering officer with a central government organisation. She has been with this organization since 1992, and her interest in farming began from her concern about the bio-degradeable waste generated every day by the canteen she managed. Pushpa was attracted to the idea of turning this waste into a resource through composting, and started growing vegetables on the terrace of her office building. 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 home food habits with what is grown, and facilitate people's return to living with the cycles of nature.

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. The data included 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. 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.

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.

Here I report 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 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 Board of Secondary Education (CBSE) school at a Mumbai suburb. The site was chosen based on availability. 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. 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 rains. There was good drainage and a water source, so there were no immediate resource issues.

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 student 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. 10 parents were also interviewed, to corroborate the experiences shared by students.

4.4 Data Analysis

4.4.1 Methodology

Usually, case studies are analysed based on the constructivist paradigm, which emphasizes the social

construction of reality (Searle & Willis, 1995). Analysing data from multiple sources and viewpoints is thus 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.

The focus on practice, communities, and the way these change individuals, makes my study similar to the 'Communities of Practice' approach (Lave and Wenger 1991, 2002), which seeks to understand how changes in individual cognition occurs as a result of participating in communities of practice, particularly as the novice moves from the periphery to the core of the practice. In this view, identity building has been seen as a motivating factor, though such intentions are not a prerequisite to become a member of the community (Wenger, 2011). There are very few empirical studies with explicit focus on motivational processes (Ardichvilli, Page & Wentling, 2003). My approach thus seeks to broaden the communities of practice discussion, with a focus on how motivations develop through the practice of urban farming. One key difference is that situated cognition and learning studies in this tradition examine cases where community participation and learning a practice are one and the same. I am interested in how participating in a situated practice leads to individuals becoming motivated to start new practices that support the environment.

The transcribed interview data was thematically analysed to identify patterns, structures, and relations in the data. Themes were inductively created from the data, rather than 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 the expanding sphere of actions.

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.

Chapter 5: A Case Study of a Community Urban Farm

A volunteer farming group was studied (participant observation; case-studies of five volunteers) to understand salient practices and community interactions, and how these influenced 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. 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 Description of the farm

Urban Greens (UG, pseudonym) is an urban farming group. I conducted my research as a participant-observer at the group's farm. Announcement about farm timings and activities were posted on the WhatsApp® group and the UG mailing list. The usual 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.

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, 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, so that explanations for each task could be provided.

One of central activities on the farm was building microbe rich soil termed as *Amrut-Mitti*. It is

made by decomposing dry bio-mass, comprising mostly of dry leaves, using an organic accelerator called *Amrut-Jal*, which is made from a mixture of water, cow urine, cow dung and organic black jaggery. Cow dung contains many microbes that aid in decomposition while the urine has high amounts of ammonia, which creates an ideal ambiance for the microbes to multiply. Jaggery aids in fermentation. The method harks back to the traditional practice of keeping cows near the farm, thereby allowing a mutually beneficial relationship between the soil, farm produce, cows 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. This 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 soil.

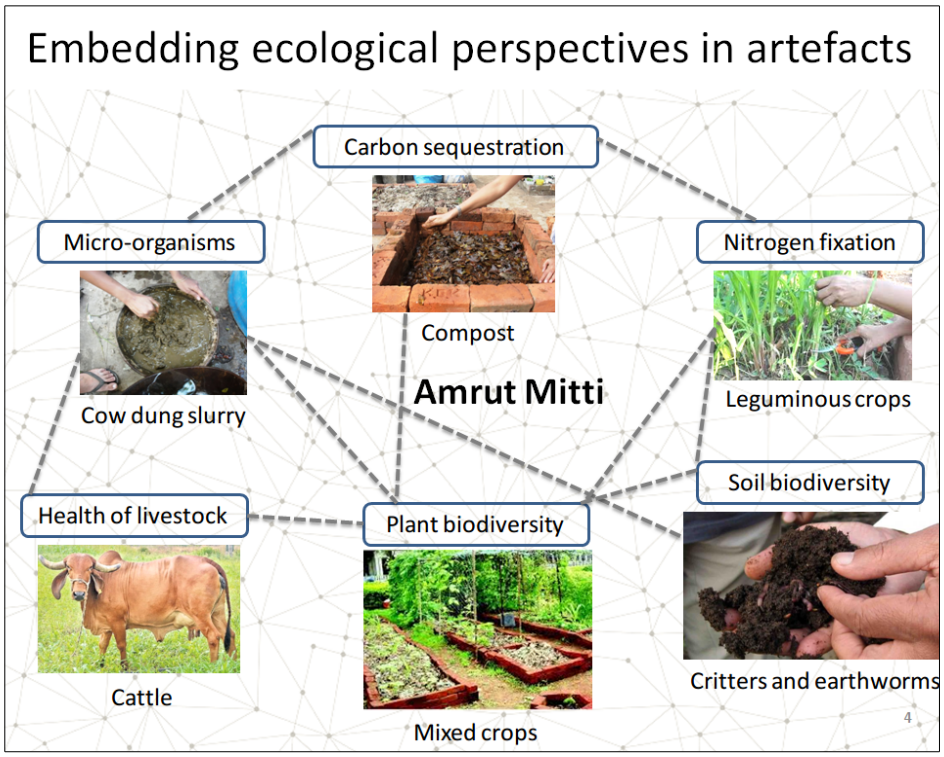

Figure 5.1: The process of making *Amrut-Mitti* embeds diverse environmental considerations and systemic understanding of relationships, and brings them them together in an integrated form.

5.2 Emerging Themes

Different themes and categories emerged from the analysis of volunteers' activities at the farm. A schematic diagram of the themes are shown below:

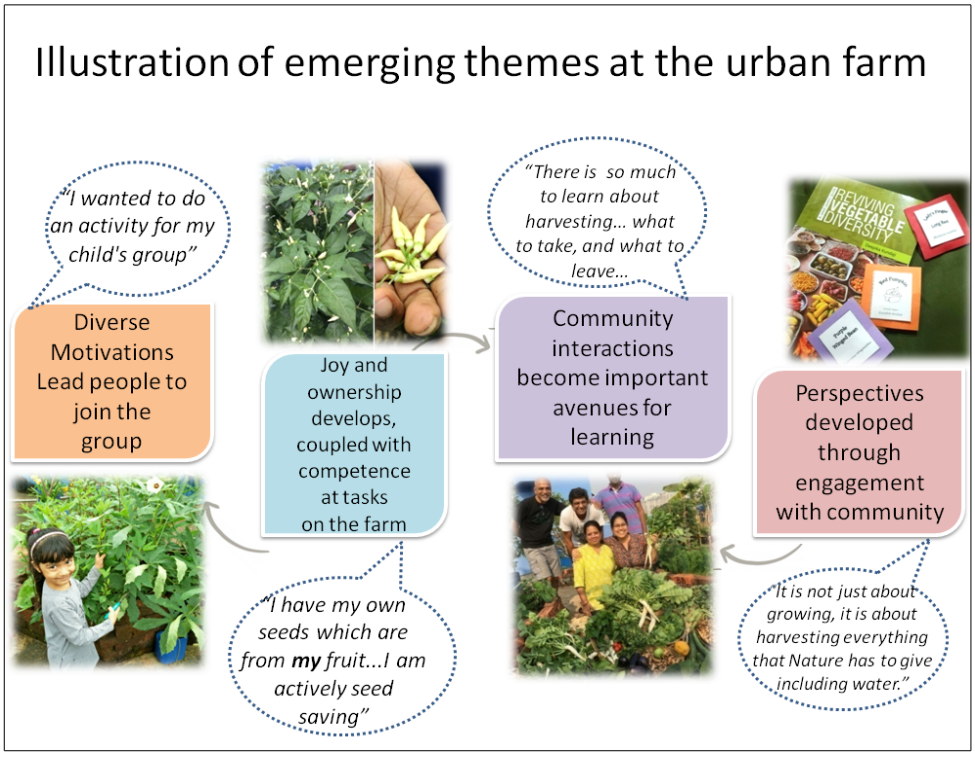

Figure 5.2: Themes identified in the context of volunteer interviews and farm observations

5.2.1 Diverse motivations lead individuals to become volunteers

Volunteers cited varied motives for joining the group. Surprisingly, the reasons cited were not environmental. 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 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, which begin from personal interests and slowly encompass wider goals. These goals become salient through involvement and interaction at the farm.

5.2.2 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. The subsequent gain in knowledge and skills were associated with pride in the accomplishment of the task at hand. There was a gradual increase in the repertoire of activities that volunteers felt motivated about, and this developed through tangible positive feedback, in terms of harvest or encouragement from peers. 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 was enhanced through the close nurturing of the farm.

5.2.3 Community interaction as important avenues of learning and motivation

Volunteers engaged in diverse tasks on the farm, guided by more experienced urban farmers, and this apprenticeship led to gaining of specific knowledge and skills. The learning is situated within the context of farming (Lave and Wenger 2002), through actual handling of artefacts in the farm. Constant feedback from peers also acted as a motivation to learn more.

5.2.4 Guided attention motivates changes in perspective

Volunteers reported particular tasks on the farm as drawing their attention, and subsequent concern, to phenomena they were otherwise unaware of. Participating in the making of *Amrut-Mitti* provided volunteers with a visceral sense of ecological relationships. This sense emerged from volunteers performing different actions still part of life in Indian villages, such as getting cow-urine, cow-manure and dry leaves, bagasse and local soil in order to make *Amrut-Mitti*. These actions created a

'coagulative'[1] practice – a set of actions that generated 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. 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.

5.2.5 Influence in perspectives through engagement with community

Different engagements at the farm scaffolded many narratives related to the connection between humans and plants. These evolved into general perspectives about the environment. Participatory artifacts such as *Amrut-Mitti* can be seen as 'performative substances'[2], which embed and embody a specific stance towards nature. They are performative substances because working with these substances allow volunteers to understand the embedded perspectives 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. 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. 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

1 'Coagulative' practices describe the convergence of seemingly disparate ideas through a practice. Participating in the practice allows one to understand the relationships between different entities involved. In the case-study, the term captures the way working with these materials brings together diverse aspects of Nature, to generate a 'web' or 'network' understanding of the environment. 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 the 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).

2 The term 'performative' has been used to describe language which can effect 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 to 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).

examples illustrate the way wider narratives emerge through practice-based embodied interactions. Sustained participation and engagement with practices on the farm thus contributed to a significant shift in perspectives.

Chapter 6: An enactive account of motivation

A dynamic model of motivation, based on interaction with artefacts and community is proposed. The model is inspired from embodied accounts of cognition, and extends the process 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 here provided insight into changes in individual volunteers as they began situating their agency in farming related activities. A 'personal transformation' is generated by the perspectives embedded in the practice, which are affirmed through peer feedback (Goralnik and Nelson 2011; Hards 2011). This leads to the farming practice being understood in relation to wider environmental issues, such as food miles, seed sovereignty, water usage, increasing local biodiversity and so on. Our 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.

In this study, I found 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. 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.

6.1.2 Proposed model of the process underlying motivation

The relationship between community practices, individual actions and evolving narratives, revealed by our study, is captured in the following model, mediated by other factors such as grounded knowledge,

competency, sense of ownership and personal interest. This model extends the emerging embodied cognition framework to the problem of motivation, by capturing the interaction between artefact based engagements and evolving narratives. 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 1991; Nardi 1996).

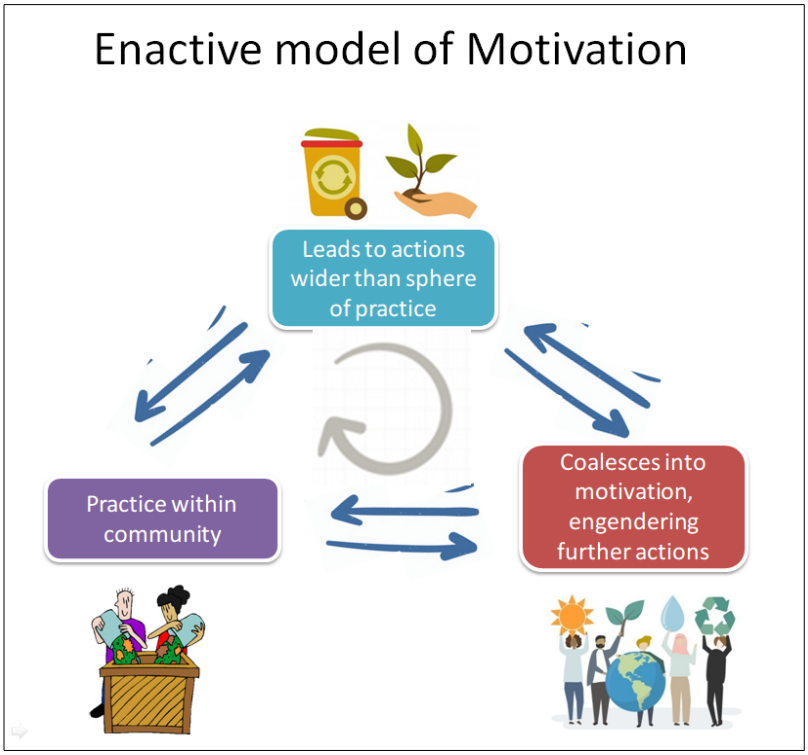

Figure 6.1: A model of how motivations develop from 'embodied' actions performed over time. In this context, wide-spread actions away from the site emerge because of the nature of growing plants.

Furthermore, material engagement enables and scaffolds the development of social interactions (Gallagher, 2017). This suggests our ability to adapt to the environment based on building artefacts and tools (Ellis, 2015) also helps build social structures. Malafouris (2014) uses the term 'thinging' to highlight the cognitive processes instantiated in the form of thinking and feeling with, through and about artefacts. Rather than acting as passive objects, artefacts afford a range of interactions, and the

nature of interactions (burning leaves or composting it) embed normative perspectives. Our work extends this theoretical view (Malafouris, 2004, 2013) to include normative perspectives, which are revised through interaction with artefacts of practice. Farming, particularly as a community practice, offers ‘performative-substances’ which help coagulate various environmental themes, and can thus provide engagements that lead to development of resilient environment-oriented communities. The following diagram describes factors that facilitate the 'Artifact-Performance-Feedback-Coagulation' (APFC) model of motivation. 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. This is an iterative process.

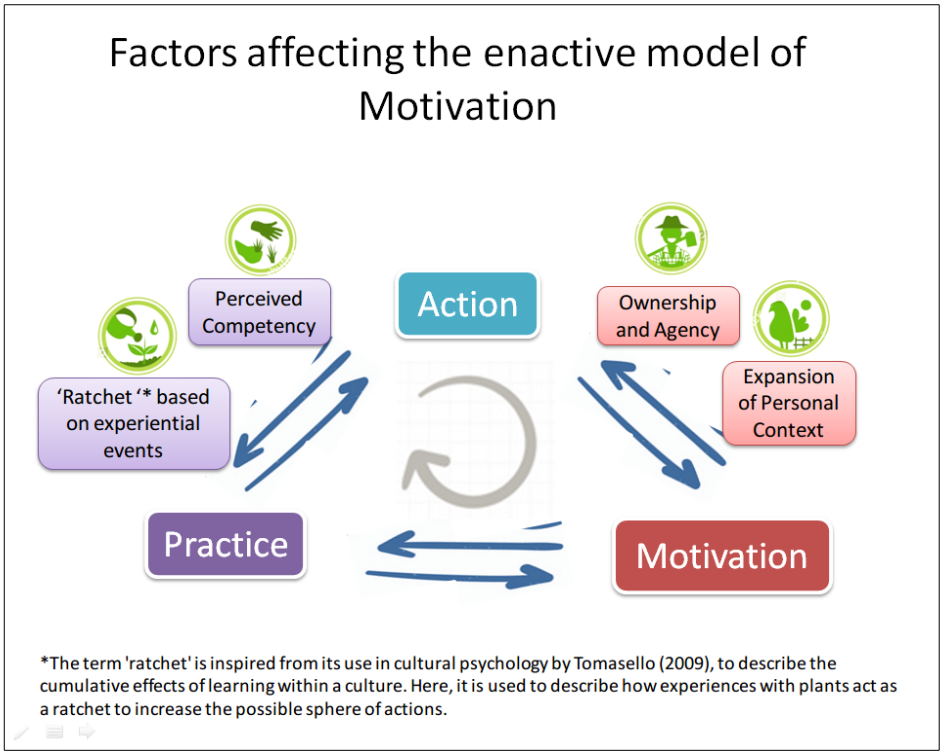

Figure 6.2: A description of factors that facilitate the APFC model. In the case of the farm volunteers, their perceived competency and experience within the community motivated wider actions, which in case positively affected sense of ownership and led to expansion of issues considered to have a personal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

Chapter 7: A School Terrace Farm Intervention

The design and results of the school farming project are presented. The design of the project was based on findings from the study of the volunteer-driven urban farm. 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' response to farming activities and their subsequent actions, particularly in the wider community, were identified as indicators of the success of the intervention. Students reported expanding on their experience of growing plants at school 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 Intervention design

A 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 as integral to one's own well-being (Enqvist, Svedin & Tengö, 2018).

At the community farm, the practice of collecting biomass and making compost deeply impacted all volunteers, who felt that the actions helped them appreciate the importance of nutrient-rich soil. Hence, it was decided that students should also experience this process, rather than simply work with soil from a nursery. This activity involved sourcing organic matter from neighbourhood and school areas, thereby allowing students to understand the cycle of 'waste' becoming resource. 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 and moisture with plant health. This also required segregating plastic from organic matter, and gave students a visceral sense of plastic pollution in their 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 and nutrients.

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 fruits and vegetables 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 learned 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.

Based on the farm observations and interviews , the following themes were seen as salient to students' interactions with plants and the extended community.

7.2 Students' interactions at the farm – Emerging themes

7.2.1 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. 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.

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.

7.2.2 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.

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. Such encounters allowed for spaces of intimate, non-representational forms of connection with the farm. Bennett (2010) 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.

7.2.3 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 artefacts like plastic bottles and trellises) kindled their enthusiasm to explore related tasks. 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. For instance, 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.

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 to finish a task, or volunteered to come during holidays to ensure that the plants were taken care of. Hart (2000) describes the importance of authentic participatory experiences, which allow students to understand the gravity and relevance of their actions.

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. Episodes of seeds sprouting, plant fruiting, and noticeable recovery of plants from infestation led students to feel markedly more involved in farming. 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 interesting topics 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 others encouraged students to continue sharing their experiences at the farm.

7.2.4 Actions away from the farm site

Students reported diverse ways in which their immediate community became involved in different activities related to the farm. 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. 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. 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 them. Others maintained an active interest in the development of the farm, even if they were not able to help directly.

It was especially interesting to note that senior citizens, particularly grandparents, who usually 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 interest. This overlap seemed to have motivated the seniors to explore more activities in this space.

7.2.5 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. Many students found themselves empathizing with farmers, as their respect for manual labour and food grew in the process of working at the farm. Other felt that their engagement with composting, and adding cow-dung slurry and mulch to soil, helped them appreciate the richness of the soil as an entity.

7.3 Parents' perspectives

To validate the responses of students regarding the activities at home, parents' viewpoints regarding their children's involvement on the farm, as well as their own initiatives if any, were sought. 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 explained to the parents the happenings at the farm in vivid detail. Most parents felt that their children seemed to take more interest in their natural surroundings in different ways after their farming experience. Some parents mentioned restrictions in the residential societies as a deterrant for growing plants in their balcony. However, a majority felt inclined to support their children, and felt the activity was a good way to bond with each other. A few parents began to volunteer at the school farm as a result of interactions at home.

7.4 Summary of observations from the case-study

The case study of the school terrace farm indicate 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,

enabling 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 humans who 'care for their environment'.

V) Students' experiences on the farm facilitated 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 were mediated by their participation in different farming activities, such as making compost, plant-care, seed-saving and so on.

VI) The farming 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, seemed enthusiastic to share their experiences of farming with the students.

VII) Interactions with extended community of peers and role-models 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

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. These findings were supported by the intervention study, as similar episodes were observed among students, where embodied experiences through interactions with performative substances such as compost, Amrut-jal, seeds etc. expanded students' action possibilities, in relation to various artifacts in their environment. Students' evolving affective engagement towards the immediate environment acted as a stance, through which they made subsequent observations of their neighbourhood.

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, and shared actions, provide additional dimensions for extending the previously discussed model of motivation.

8.1 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 developed environmental care and concern.

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[3], through the range of interactions at the school

3 '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

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 be grown in the balcony. A few students 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 students, in the form of encouragement or affirmation of their efforts by relatives or teachers, further bolstered the wider sphere of actions, away from the original site of practice.

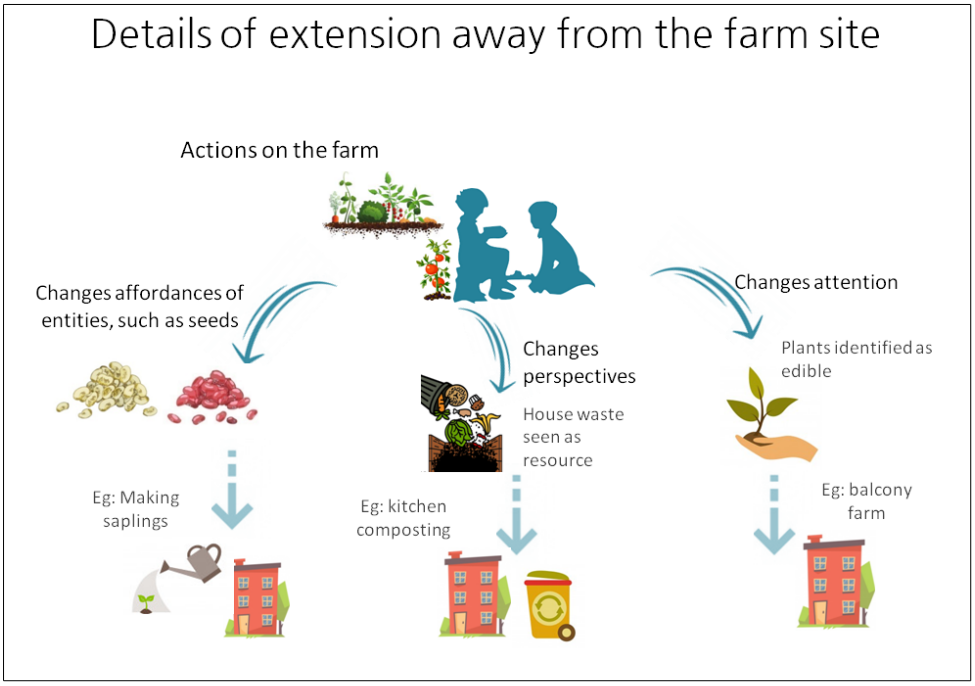

Figure 8.1: Students move into activities away from site, through the expanded action-space and affordances generated by activities in the farm

8.2 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 compost, and countless

property, depending on both the environment, and the individual.

other encounters 'invited' students to participate in an evolving, reciprocative relationship with the farm environment.

At the farm, the plants were not objects of scrutiny, rather they became enactive participants, helping expand students' relationship with their surroundings. This expansion in turn allowed students to attend to wider experiences, and develop greater sensitivity towards the farm space. Moments of 'enchantment' (Bennet, 2010), which heightened student awareness towards the farm activities, allowed the usually ignored 'background' to present itself in novel, wonder-inspiring ways.

Honing one's attention towards particular aspects of the environment generated instances of 'response-ability' (Haraway, 1997; Kayumova, McGuire and 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. The diagram below illustrates the trajectory of such evolving relationships.

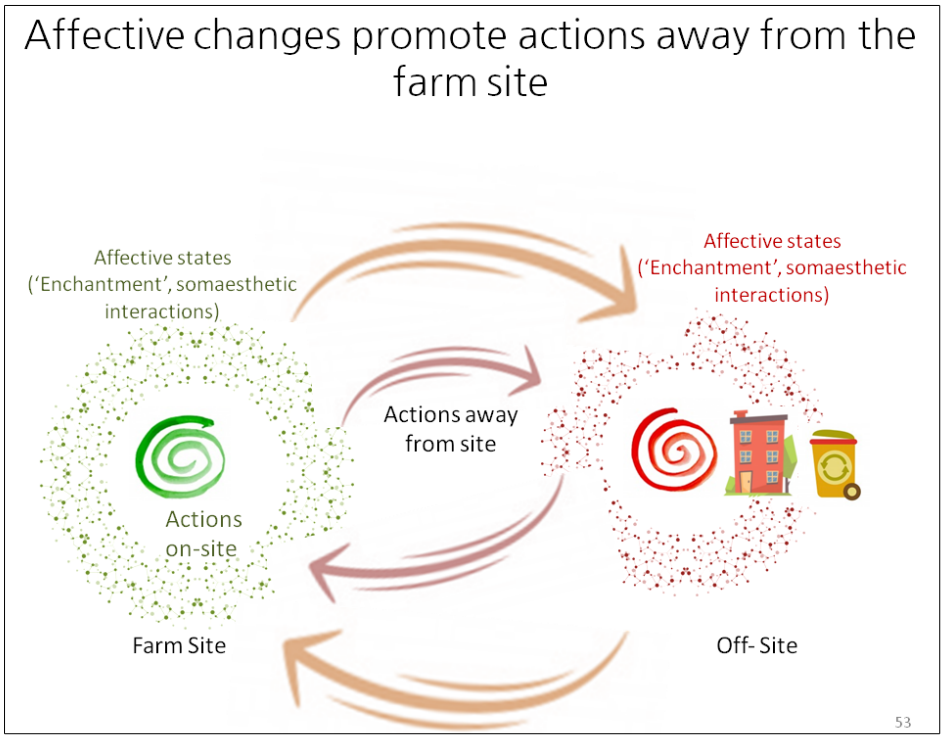

Figure 8.2: Processes involved in students' interactions with the plants. Initial experience with plants,

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

8.3 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) is 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.

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[4] already have existing affective components (through family bonds and sensory interactions with the plant) that are reinforced through the participation in farming activities. In other words, the embodied experience of the student is strengthened by the relationships with others (Candiotto, 2016). Székelya and Michael (2018) describe an empirical study to demonstrate

4 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).

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.

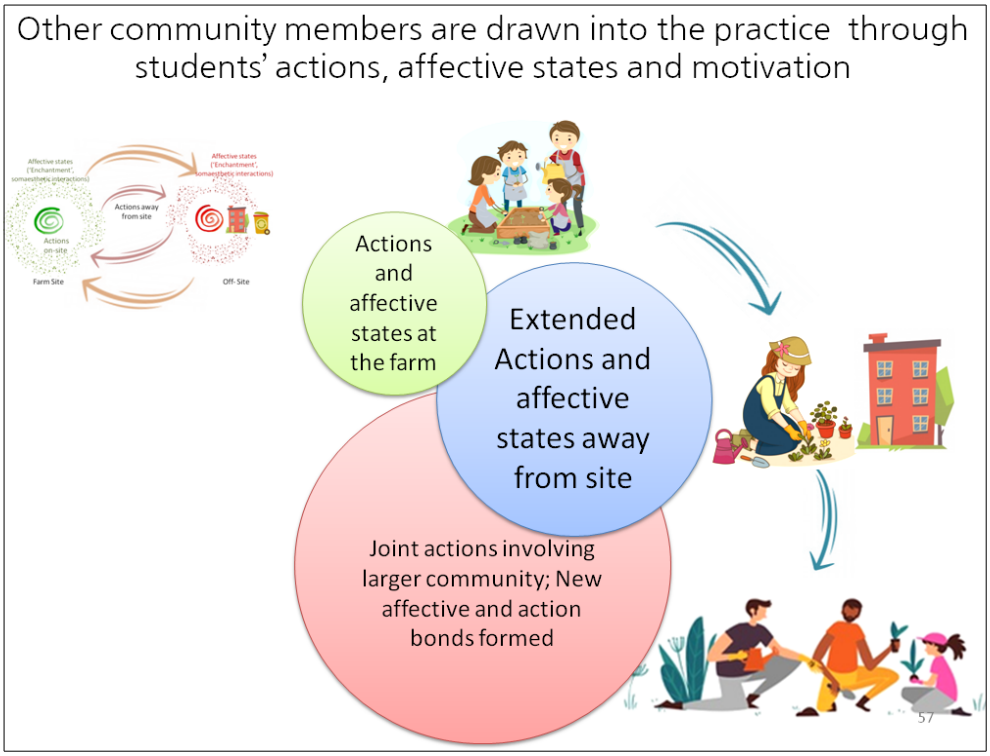

Figure 8.3: A proposed 'field of motivation' that expands through shared actions and the resulting extended scope of activities. Students' interactions with plants on the farm create an expanded action space as well as opportunities to engage in shared actions with family (such as plant care, composting, seed saving, collecting biomass etc). Shared actions in turn, allow for social bonding, and act as an added motivation to participate in various activities

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.

Integrating these findings, we propose that changes in affective states are manifested in care-based interactions, which reinforce and expand the sphere of of actions taken towards the immediate environment. This finding helps extend the model of motivation, as illustrated below:

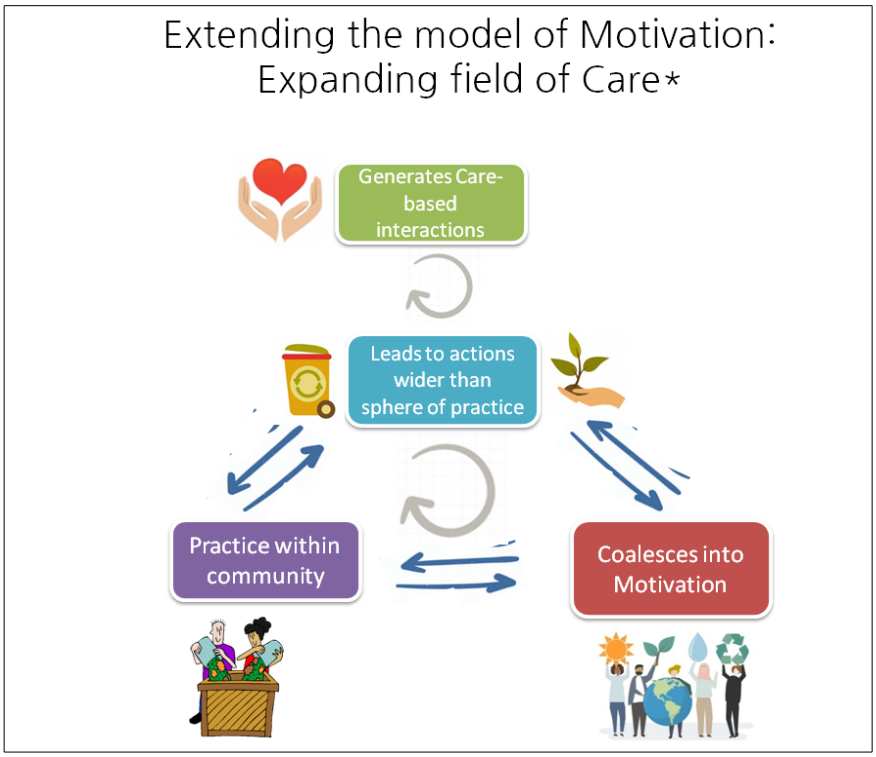

Fig 8.4: A revised model of motivation, focusing on the sense of 'care', and the way it feeds into actions that expand the sphere of practice (of attending to plants, in this case)

Chapter 9: Teachers' Perspectives

The school farming project provided an interesing contrast case to the conventional interventions for EE (which are based on information dissemination). Here I seek to understand how teachers situated themselves in relation to the farm, and what were its implications 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 base pedagogy on relevant experiences. Their views also explain the constraints and difficulties faced by them in conceptualising and implementing practices such as farming within the curriculum. I capture broad themes that emerged from different teachers' thoughts and initiatives based on their experience of the school farm.

9.1 Teachers' perspectives at the school

Two 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, two 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. Their responses are discussed thematically as follows:

9.1.1 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. 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. 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.

9.1.2 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 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 not directly involved with work on the farm. These 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 to the project.

Malini found the farm to be a good resource for helping students understand concepts in biology. She said students found it more interesting to observe the farm, rather than read abstract descriptions in the textbook. Malini and Seema also did a composting experiment as part of a science project, where they compared features of aerobic and anerobic 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 experience.

9.1.3 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. Samiksha

began composting at home, 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. 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 the family.

Other teachers mentioned composting at home, and talking to residents about composting. They did not 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. 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.

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

These narratives indicate a variety of ways in which the terrace farm turned into a space of reflective enagement 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 an activity space. Formerly, as an out-of-bounds, locked-up space, the terrace was 'naturally' barren, until farming activities gradually transformed the area.

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 availabilty etc. she presented a more authentic and inter-connected 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, and thus a lack of embodied experiences that promote the shift in perspectives, which might have facilitated some shift in their teaching practices. Their appreciation of the farm was thus qualitatively different from Samiksha's, since they saw it more as a means to teach students “better science”, despite some pro-environmental actions taken in their personal spaces. Thus, despite teachers' good intentions, there is a a fair chance of the farm activities getting appropiated by the curriculum, as instruments to help students gain discursive knowledge about the environment.

The perspectives shared by the teachers offer a glimpse into ways in which embodied 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 percieved disciplinary and practice boundaries, while others stem from inadequate experience of participation in sustained ecological practices (such as farming).

Chapter 10: Discussion and Implications

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 the challenges and the potential of environmental practices in cities. The results from the study indicated that community-based practices can provide useful insights towards developing an action-oriented pedagogy for developing ecological sensibilities. 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.

Design of further similar interventions would help seed environmental perspectives, rooted in the ecological ideas of interdependence, care, and the well-being of more-than-human living beings. EE based on such interventions would emphasize 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.

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 entry points to start a community activity. Further research to understand diverse motivations, and how they could converge towards environmental motivations, would help widen entry points to move to PEA.

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. Artefacts “become part of a broader 'web of cultural meaning' that enables a range of nuanced and normative action-perception cycles” (Gallagher & Ransom, 2016; p. 340).

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

The studies indicate that 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.

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. 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, and Salmela, 2014).

10.2 Implications of this work

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, to develop more mechanistic explanations of the motivational processes.

b) Evolution of values though sustained artifact-based practices

The thesis focussed on understanding the motivational processes of PEA. However, the findings suggest that participants experience a normative shift in their perspectives, thus leading to changes in values as well. Many of them reported developing pro-environmental values such as frugality, re-usability and promoting bio-diversity emerge 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 linear, modular and transactional value system.

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; Rahaman et al, 2018). In this view, cognitive capacities are not just enacted, but *created* through interaction with physical entities in the environment. I extend this argument to include the evolution of normative perspectives through material involvement.

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

The study 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 develops from affective responses to manifold aspects of the environment.

The model foregrounds the notion of 'care', which arises from relating (and thereby responding) to other living entities through body-based experiences. Such situated experiences support a socio-political commitment to attend to the particularities of a phenomena, bounded by experienced relationships rather than abstract moral codes. Haraway (2008) refers to such actions as being based on relational ethics, wherein the focus shifts to 'response-ability' (p.71). The active emphasis on the ability to respond, through body-based interactions, results in questions and concerns emanating from lived experiences. 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.

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. 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.

This led to the understanding that the well-being of one cannot be satisfied without the flourishing of others. Farmer and Philosopher Wendell Berry terms the ability to solve problems in ways that understand and respect this interconnected relations of living systems as 'Solving for Pattern'. Practices such as farming, which support the development of sensitivity, and responsibility, to attend to, and care for, larger ecosystems, provide the means to imbibe a 'Solving for Pattern' approach. This stance, once formed, informs one's action in every situation, thus contributing towards an ecological perspective.

10.2.2 Pedagogical and Policy implications

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

Teaching is not, and cannot, be a value-neutral enterprise. Given the above results, it is worth considering the 'moral character' that is developed (unintentionally) 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 (2018) 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 range of interventions that allow for visceral

interactions, require some form of stewardship, and provides the space for cultural-ecological[5] dialogues to emerge. Examples include managing local water bodies or rain water harvesting, community farming, improving habitats of local fauna and so on. 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. 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.

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 such a set of practices would help educators understand the different patterns underlying the issue. What would be a 'performative' substance in this 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.

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 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

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

also subverts the consumerist model of a school system (Apple, 2001; Baltodano, 2012), by sustaining context-specific and place-dependent interactions.

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. Far from being barren, urban areas can be rich pockets of biodiversity, with native and non-native species assemblages (Aronson et al., 2014; Faeth, Bang and 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 and McMillen, 2016).

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 motives and narratives.
- Use the existing research in embodied and situated cognition to further the literature in environmental motivation.
- Design an evidence-based 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 of the thesis

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:

- 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 affects have not been systematically included in the model. Heightened

affective states arising from language could impact information-processing in significant ways, which might 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 such as anger and hatred (through ritualistic practices that make in-group, out-group differences salient (see Whitehouse, 2018)) could also inform actions, and strengthen motivation in different ways.
- Mechanistic account missing: The model hints at cognitive and biological mechanisms that could explain the motivational processes, but does not provide any details of the dynamic structures involved. Thus, the model is mostly descriptive.

10.4 Conclusions

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, there is also a deeper worry, stemming from an understanding of the manifest collapse of the ecosystem as just symptomatic – our relationship with nature is fractured. 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.

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 the 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. These connections constitute 'learning to see' as Ingold (2002) explains, by "acquiring the skills for *direct* perceptual engagement with its constituents, human and non-human, animate and inanimate" (p.55). This thesis in essence, argues for the power and possibility of grounded engagements, and its urgency in an ever fragmented world. The work presented here hopefully offers a step in the direction of healing, both ourselves and the environment.

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