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Doing to being: farming actions in a community coalesce into pro-environment motivations and values

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ABSTRACT

A key mandate of environment education (EE) is to motivate people to engage in environmentally responsible actions. However, school-based EE has not been successful in nurturing environmentally responsible actions in students. This is partly because of the information-oriented structure of current EE, which assumes that symbol-based knowledge directly leads to motivation and action. In contrast, educational initiatives based on practices and actions in the world, with farming as an important component, have been successful in creating transformative changes in behavior. To develop similar transformative interventions that motivate school students, it is necessary to understand the general psychological principles that make such participatory designs successful. Here we report a year-long observation study that seeks to contribute to such a general model, analyzing how farming actions changed the motivation of volunteers working in an urban community farm. We take an analysis approach inspired by recent embodied cognition models, where volunteers' lived experiences and interactions with material entities are analyzed, to understand how motivation and values develop through such interactions. Based on this data, we propose a spiral model of motivation and action, where specific farming actions coalesce together to form motivation and values, which then seed wider environment-oriented actions in the world.

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1. Introduction

Environmental degradation is spreading rapidly, and has reached critical levels (MEA 2005). Numerous programs now seek to *inform* people about the alarming state of the environment. However, growing evidence shows that increased *knowledge* about the environment does not necessarily lead to environmentally responsible behavior (De Young 1993; Payne 1999; Robottom 2005; Steg and Vlek 2009; Iared, de Oliveira, and Payne 2016; Payne 2016). Information-based programs to promote environment-oriented behavior assume that descriptive symbol-based knowledge by itself can lead to actions. This is a simplistic model of action, as the knowledge component is only one part of a complex network, made up of various factors such as motivation, social norms and supporting structures (Hungerford and Volk 1990; Finger 1994; Kollmuss and Agyeman 2002; Moisander 2007; Birdsall 2010). In particular, individual motivation is one of the important components of purposive action (Gollwitzer and Bargh 1996; DeShon and Gillespie 2005), and an understanding of how motivation develops in individuals can contribute significantly to the scaffolding of pro-environment practices.

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To be effective in terms of changing individual behavior, environment education needs to go beyond the information-based model of environmental action, to include practice-based motivation at the individual level. This shift requires two components: (1) an understanding of how individuals become motivated to participate in environmental activities, and (2) a way of using this understanding to design interventions that motivate individuals to take up environment-oriented actions. In this paper, we focus on the first theme above – how individuals engaging in local practices within a community develop the motivation to extend these practices to environment-oriented actions and behavior. We show how this motivation emerges even when: (a) individual participants start these practices with very pragmatic and non-environment-oriented intentions, and (b) each individual participant's ability to take environmentally sustainable actions is impeded by various social as well as cognitive factors. We focus on how the practices, and the support from a community of practice, together leads to transformative experiences that could potentially change individuals' motivation and ability to engage in environment-related actions, particularly in their communities.

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

To explore this practice-driven development of values, we studied an urban community farm, to understand how farming practices 'grounded' individual volunteers' emerging notions about the environment, and the ways in which their engagement with farming practice made possible larger interactions with the society. Following recent embodied cognition theories in cognitive science (Glenberg 2010), we take an embodied approach to understand how such motivation and values develop, giving primacy to lived experiences and interactions with material entities. In this approach, body-based interactions are examined to understand their contribution to changes in motivation and values. This approach is different from analyses that focus on language-based discussions and material, where change in motivation and values are considered to emerge from interactions with purely symbolic structures. We argue that experiences and interactions with farming materials and practices, supported by community engagement, leads to changes in individual motivation. Our specific focus here is the mediating role played by artifacts and practices in the development of environmental values.

Our study is based in India, a country with an increasing urbanization trend (Mohan 1996; Datta 2006). Urban spaces, with their insatiable demand for natural resources, act as drivers of environmental damage even in villages. India thus faces the loss of traditional practices and knowledge, many of which have pro-environmental values embedded in them (Berkes, Colding, and Folke 2000; Rai 2007; Ramakrishnan 2007). A focus of our study is the way practices in urban spaces seek to recapture this traditional knowledge, even as urban spaces perpetuate the nature/culture divide by distancing themselves from the conditions and modes of agricultural production. Nurturing pro-environmental values amongst urban communities, which face a physical and psychological disconnect from various aspects of nature (Rees 1992, 2000; Dillon et al. 2005), is a challenging task. Yet, as Michael Pollan notes, 'Eating and drinking especially implicate us in the natural world in ways that the industrial economy, with its long and illegible supply chain, would have us forget' (Pollan 2013, 408). Consequently, the potential of local urban food systems in promoting socio-cultural and ecological sustainability is a growing field of research (Thorp and Townsend 2001; Krasny and Tidball 2009; Turner 2011).

We start by outlining the limitations of information based environment education (EE) (Section 1) as discussed in the literature. As a contrast, we provide a few examples of successful practices that

promote environment-oriented actions, with farming as a common thread connecting these practices. The nature of farming as an activity in urban places (Section 2) is discussed, with its potential to engage with different facets of the environment, including weather, water, soil and health. Section 3 describes the study conducted in an urban community farm. Section 4 elaborates the findings and its implications for designing educational interventions. Section 5 connects our analysis with related literature, and proposes a general principle underlying the design of such environment-oriented practices.

1.1. Critique of information-based EE

Studies suggest that environment-related information currently presented to people does not provide opportunities for constructive engagements at the ground level (Blake 1999; Kollmuss and Agyeman 2002; Kennedy et al. 2009). Further, this information does not enable people to form an empowered community, and participate in environmentally sustainable behavior, based on tangible outcomes (Jensen 2002; Chandrasekharan and Tovey 2012).

Broadly, the aforementioned literature suggests that information based EE fails to address the problem of ecological issues being distant, temporally and physically, for most individuals. This distance prevents immediate feedback, which is a key component needed for action. The physical distance between consumers and the sites of environmental degradation creates cognitive and emotional disengagement, and this leads to people trivializing environmental issues. In such cases, the 'locus of control' seems far removed from the individual, thus prompting questions like, 'what difference would my actions make?' The accompanying feeling of apathy and resignation could form a negative feedback loop (McCarty and Shrum 2001; Cleveland, Kalamas, and Laroche 2005).

Related to this, the connections between the individual scale of actions and the global scale of environmental damage are difficult to establish. The excessive focus on individual choices also limits the scope for more critical actions possible at a community level. Furthermore, engaging in pro-environmental behaviors usually requires going against the current of many established practices. Pichert and Katsikopoulos (2008) show that many environmental choices depend on the default option available, and the difficulty in judging trade-offs and reconciling conflicting objectives (such as saving money on cheap fuel or going for greener options). Disengaging from such 'default' actions requires deliberating over choices, and this exerts a cognitive load on the individual. Additionally, environmental problems are usually highlighted in ways that evoke guilt or anxiety, rather than in ways promoting willingness or interest to engage with the ideas.

Given these complex psychological issues, recent approaches to EE emphasize the primacy of action-based approaches (Jensen and Schnack 1997; Barrett 2006; Almers 2013; Percy-Smith and Burns 2013). The focus is on specific actions stemming from conscious decision-making rather than abstract conceptions of behavior-change. The latter is unstable given the lack of context, raising the risk of falling back to 'old ways' when external conditions change (Lindenberg and Steg 2007). Studies show that behavior can be sustained on a long-term basis if the motivation for those set of actions are self-determined and internally regulated, rather than directed using external systems of rewards and punishments (De Young 1985, 1996; Bruyere and Rappe 2007; Darner 2009). In their self-determination theory, Ryan and Deci (2000) posit the need for competency, autonomy, and psychological relatedness as basic drives that lead to intrinsic motivation. These factors have been further explored in the context of pro-environmental behaviors by other researchers (Cooke, Fielding, and Louis 2016). The challenge thus lies in motivating people to positively engage with environmental problems, particularly creating a space and 'action-scripts' (Chandrasekharan and Tovey 2012) for environmentally sustainable practices. Such 'action-scripts' need to be based on the recognition of the environment as an interconnected system, and understanding this is a significant challenge in education. This challenge partly stems from the current bias of teaching students to reduce phenomena into isolated entities, stripped off from their context, interaction and interdependent relationship with the environment they are part of (Bonnett 2013).

1.2. Practice-based environment education initiatives

A leading alternative to information-based environment education is practice-based designs, which can help develop pro-environmental values and sustained action. A few such initiatives have emerged recently at the grassroots level, wherein a community-level intervention had a transformative effect on many environment related issues. Green Bronx Machine (2016) is an organization founded by educator Stephen Ritz. It originally began as an after-school, alternative program for high school students. The initial effort was simply to grow local food, in response to the alarming levels of obesity and malnutrition in South Bronx, a relatively poor district in NY, USA. However, it soon grew into a movement, with tremendous community participation, to convert vacant plots into edible food gardens. The movement eventually addressed issues of food security, senior citizens' health-care, local employment and much more.

In a similar vein, *Mathrubhoomi* SEED (Student Empowerment for Environmental Development) initiative is a novel project in Kerala state, India, started in 2009 by the *Mathrubhoomi* newspaper. Volunteer employees from the newspaper coordinate with students and schools interested in starting projects such as energy conservation, organic farming, and related initiatives. It is now a state-wide movement involving citizens' participation in growing local food, protesting industrial pollution and reviving indigenous plants. Within a formal school set-up, Anand Niketan is an interesting example. It is a rural school in Sewagram, Maharashtra, India, started in 2005 as an institution based on Gandhi's educational philosophy (Gandhi 1980; Sykes 1987). Farming, cooking, and fabric making are some of the major engagements at the school. These activities have led students to assume ownership of the locality and community. Issues pertaining to garbage disposal, waste management, pesticide usage and water availability involve active engagement with tangible outcomes in nearby villages.

These initiatives focus on local, participative environmental actions, and are hence 'transformative' in nature (Sterling 2001) – a transformation in one's perspective is accompanied by change in the surrounding environment. The process by which such initiatives emerge, and how they change environmental behavior, has not been studied in-depth, and an understanding of this process is needed for developing educational systems and policies that support similar action-centered environmental approaches. Also, these grassroots initiatives have not been analyzed from the viewpoint of understanding the interaction between motivation and pro-environmental actions. Our research focuses on developing a detailed characterization of such a community-level practice, specifically examining its effect on individual motivation and action. Stimulating similar engagements across different areas requires understanding the dynamics and operational principles of such movements.

1.3. Farming as a practice

It is not surprising that many such community-level efforts have an active farming component, given that farming is the 'largest interface between humans and environment' (de Vries 2012, 339). As an activity, farming naturally provides a space to raise questions, and develop an integrated understanding of, weather, food, nutrition, the economics of food production, water, and local geography. Harper (1995, 198) explains that farming allows for 'physical embodiment of symbiosis and co-evolution' as seen in nature. The connection between environmental actions and the act of farming is succinctly captured by Wendell Berry's statement 'Eating is an agricultural act' (Berry 1992, 375). When linked to the conditions under which food is grown and brought to our plates, the actions involved in selecting and making food could provide insights into the human-nature relationship.

A food garden, by virtue of its elements and their relationships, embeds many action possibilities, which could help understand principles (such as interdependence) and ideas (such as recycling) related to the environment. When practiced in a community setting, farming and harvesting food from the garden would allow for many related discussions and motivations to come to fore, as would the regular tending and care of the living space. This context-driven process of learning is reaffirmed by theories of situated cognition, which highlight the importance of context in learning through participation

within a community (Rogoff 2003). The emphasis on 'action-competence', which leads to a holistic 'ecological consciousness', provides elements of embodied learning and intrinsic motivation that are otherwise missing from conventional approach to EE (Pedretti and Soren 2006; Rathunde 2009; Nazir and Pedretti 2016). Farming thus offers an integrated way to address the three psychological issues discussed earlier, which block pro-environmental behavior and motivation (lack of direct cause and effect relations, cognitive dissonance, lack of control over outcomes).

2. Urban farming as a site of practice

Recent studies show that 54% of the world's population live in cities, and an upward trend in population growth is predicted in these urban areas, despite regional variability (WHO 2017). The unprecedented rate of urbanization in the past century is a significant contributor to the rapid degradation of the environment. The expanding urban environment has been linked to global warming, climate change, air pollution, over exploitation of water resources and decrease in forest cover, among other problems (Rees 1992; McMichael 2000; Cohen 2006; Wilby and Perry 2006; Zhao et al. 2006; Grimmond 2007; Martínez-Zarzoso and Maruotti 2011; Uttara, Bhuvandas, and Aggarwal 2012).

Urban spaces are usually far removed from the production of food, and food is transported thousands of kilometers through various intermediaries. The associated high cost and ecological footprint has a cascading effect on the environment, particularly in India. The 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. Traditional farming systems are based on diversified agro-ecological practices that focus on long term fertility of the soil, and maintaining biodiversity necessary for a healthy ecosystem (Kremen and Miles 2012; Frison 2016). Agribusiness practices, with a lopsided model of efficiency and crop productivity, has forced farmers to adopt industrial practices, which compete with traditional ecological practices. As a result, rural farmers have been compelled to resort to synthetic pesticides, commercial genetically-modified (GM) seeds and large mono-cultures. Urbanization thus damages the rural landscape as well, and this in turn has contributed to diminished biodiversity and resilience, thus making the entire ecosystem more prone to ecological and economic turmoils. The cause and effect are difficult to decouple, as chemical input driven large-scale agriculture and animal husbandry have resulted in poor socio-ecological situations, which in turn lead to even greater dependency on the unsustainable practices (Jackson 2004; Conway and Pretty 2013). There is hence an urgent need for a serious shift towards production and consumption of local food, especially in urban areas that suffer from 'collective myopia' (Macauley 1996, 82), brought about by denial and trivialization of issues that need concerted action and reflection.

Since urban spaces are impoverished in terms of practical engagements that nurture environmentally responsible actions, urban farming has emerged as a community-level practice that addresses this complex ecological scenario. 'Urban farming' is broadly understood as the growing and processing of food related crops, and rearing of livestock within or in the vicinity of urban areas (Mougeot 2006, 4). Cultivation can occur in balconies, rooftops or community gardens. This practice is gaining visibility in many cities around the world, as means of sustenance, rebellion, recreation, and also for environmental reasons (Wilkins 2005; Tidball and Krasny 2007; Holt-Gimenez and Patel 2009; McClintock 2010; Firth, Maye, and Pearson 2011; Hale et al. 2011; Battersby and Marshak 2013; Biel 2016).

Urban farming is typically community-oriented, which is a strength of the practice. Barthel, Folke, and Colding (2010) conducted a four-year long study of allotment gardens in Stockholm, to analyze the transmission of ecological practices amongst communities. The study argues that community gardens are sites of 'socio-ecological resilience', as they sustain knowledge and skill needed to grow food in the area. The dialogues within the community and sharing of tasks strengthens feelings of belonging, as people exchange ideas and thoughts on a variety of related topics (Okvat and Zautra 2011).

In our study, we extend this perspective to identify a psychological effect. Analysing the role of farming practice in developing motivation, we show how motivation changes over the course of time through interaction with community engagements. The methodological approach we use is inspired by

recent studies of situated socio-cognitive practices in laboratories, where interactions with lab artifacts is examined closely, to understand how wider discoveries and learning emerge from such interactions (Nersessian et al. 2002; Newstetter et al. 2010; Aurigemma et al. 2013).

In the following sections we explore urban farming as a possible community practice, and analyze narratives of volunteers involved with a farm in Mumbai, India to understand their motivation, how it relates to the scope of their actions, and implications. Pseudonyms have been used to maintain anonymity of the volunteers.

3. Study of a Mumbai urban farm

Mumbai (18°58'N 72°49'E) is the capital of Maharashtra state, India. The Mumbai Metropolitan Region is one of the most densely populated areas in the world, with an estimated population density of 20,482 persons per square kilometer, and growing. Land is thus a premium commodity in the city, and waste management is a serious issue for urban residents (Sinha, Wankhade, and Khetriwal 2007; Lokhande, Singare, and Pimple 2011).

UF is a city farming volunteer group co-founded by Pushpa, a catering officer. Her interest in farming began from the problem of bio-degradable waste generated by her canteen. Pushpa turned this waste into compost, and grew vegetables on the terrace of the canteen to use the compost. Encouraged by the success of this farm, Pushpa, along with a few other environmental activists, decided to start a volunteer driven movement to start terrace farms at different sites in the city. Currently, UF terrace farms are maintained at two locations in Mumbai. The group is featured regularly in local newspapers. People of diverse occupations and ages (10–70 years) are regular volunteers. UF has a strong stance against commercial GM crops, stemming from the perspectives of the founders, who firmly believe in food sovereignty.

One of the important activities on the farm is the building of a microbe-rich soil, termed *Amrit-Mitti*. The process epitomizes many values that UF founding members believe in, particularly imitating the natural process of decomposition and replenishing of the soil. The soil is made by decomposing dry bio-mass, mostly leaves, using an organic accelerator called *Amrit-Jal*, which is made from a mixture of water, cow urine, cow manure and organic black jaggery. Volunteers are encouraged to make *Amrit-mitti*, and use it to grow their own fruits, vegetables and herbs, wherever they have space.

4. Research design

The exploratory nature of the study led to the use of an interpretative framework, using qualitative techniques. After initial observations at the site, individuals who showed up at least every alternate weekend were chosen as regular members, and their work on the farm tracked. The focus of the study was an exploration of the initial motivation that brought individuals to the farm, their relationship with different artifacts at the farm, the scope of their activities, and larger perspectives, if any. To understand this, we chose to construct individual case studies, as they are a useful approach to capture the complexities of social interactions (Yin 2013). Five case studies of individual volunteers were developed, based on observations of regular members' activity on the farm, and detailed interviews.

Data includes roughly 60 h of field notes based on farm observation and participation. The notes for each session were created through discussion with a co-participant observer. The participants, a subset of the community of urban farmers, were part of a WhatsApp® group that facilitates discussions about the farm. This group is actively maintained, and every regular volunteer is added to this group. The researcher was also added to this group as a regular participant. The researcher did not contribute to the conversations, other than relaying logistics related information. The farming members did not have any objection to recording and analysis of WhatsApp® data, and text logs of chat discussions were made for analysis. This data was highly dynamic and spontaneous in nature and required specific tagging and coding. The text was numbered and highlighted with relevant tags that emerged with reference to various activities on the farm.

Apart from this rich data-set, seven hours of interview data was recorded and transcribed. Given the exploratory nature of the study, grounded theory methodology was adopted, to allow for data to inform the theory building process. This approach also allows focusing on linkages between conditions, actions and consequences (Eisenhardt 1989; Corbin and Strauss 1990). Transcripts were validated using member-check, and minor corrections were made. The transcripts were repeatedly read by the researcher, followed by highlighting relevant quotes with different tags. These tags were refined to generate the first draft of the codes. With these initial list of codes, two other colleagues read the transcripts and tagged the text, highlighting sections they found relevant to the codes. A refined list of codes and definitions was generated through discussions. The following figure illustrates the themes and some of categories generated, in the context of various activities done at the farm. Shown here, from left to right, are activities like making *Amrit-Mitti*, saving seeds (Okra), and a spread of farm harvest (Figure 1).

4.1. Case studies

A brief profile of each volunteer is presented below, with two cases described in more detail.

4.1.1. Aarti

Aarti is one of the active volunteers at UF. She is in her mid-forties and lives with her family (husband, two grown-up children, aged mother-in-law). She is an amateur artist, and likes painting natural landscapes. She first came to know about UF through an article in a newspaper, and wanted to attend a workshop by them. At that time her interest was centered more around the aesthetic appeal of plants. She detested insects, and recounted feeling very uneasy handling *Amrit-Jal*. Over a period of time, she realized that insects weren't bothering her anymore, and she took lead in the making of garden compost. According to her, the experience of growing edibles at the farm has led her to change the family's diet considerably.

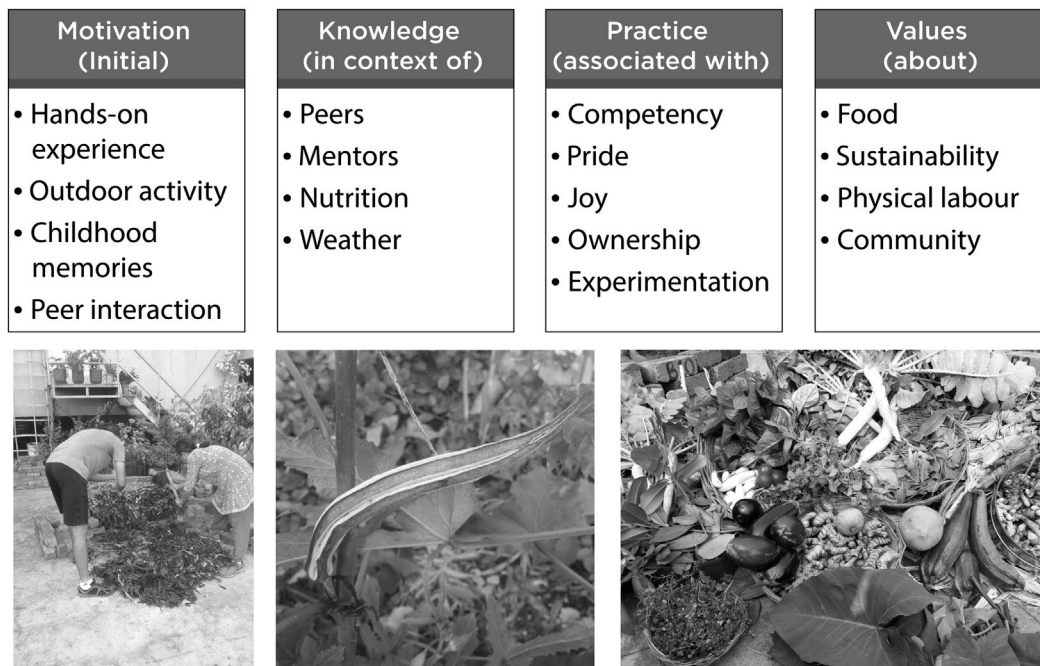


Figure 1. Diagram illustrating different themes and categories that emerged from analysis of volunteer activities on the farm.

4.1.2. Nitish

In his early forties now, Nitish described his induction into the farm as a reverse journey from exposure to healthy food to getting to know the source of it. He recalled having a serious change in diet in 2012 due to ill-health, after which he began actively looking for groups to know more about growing plants. He has a small space around his house where his parents used to grow many ornamental plants, and he wanted to grow something for consumption as well. A stickler for method, he was initially only interested in techniques. However, his interactions with other volunteers led him to take interest in wider issues, such as biodiversity, reusing materials and so on. He regularly gets discarded drums from his factory, which are used as planting pots on the farm.

4.1.3. Heena

Heena is a gregarious woman in her late forties, dividing her time between family, farm activities, marathons and classical dance. She got acquainted with UF through a friend at a running group, and found the idea instantly attractive, because it brought back memories of gardening as part of her childhood. She relies on her intuition when it comes to handling plants, and encourages others to try out different approaches on the farm. She is especially enthusiastic about the occasional potluck parties held on the farm to celebrate some harvest festivals. She now feels that the 'community' aspect of the farm carries a lot of importance for her, as she has made close friends working together at the farm.

4.1.4. Payal

Payal, one of the active volunteers, has a finance background. She took voluntary retirement from her job while in her forties, and has two children (8 and 14). She joined UF in August 2013, as she wanted to do some activity for one of her children. Her interactions began by participating in a kitchen gardening workshop conducted by UF. Soon after joining, she got associated with a UF project to teach kindergarten children (from an international school) some basics of farming. She was initially apprehensive, but the students' enthusiasm and learning led her to take the idea of urban farming more seriously. She became more interested in various activities on the farm after the project, because of the positive response from the students.

Her interest in farming led her to shift to an apartment with a balcony with decent sunshine, where she began growing plants. This was a direct result of her UF stint, which made her confident and knowledgeable about growing plants. She has been documenting and experimenting with seasonal plants, in terms of conditions needed for their growth, and amount needed for family consumption. The documentation helped her choose simple methods, and share this information with other volunteers. She also became mindful of how the weather and building architecture affect plant growth. The difficulty in procuring good quality seeds that germinate led her to take an active interest in seed-saving and sharing.

She agrees with UF's emphasis on the use of *Amrit-Mitti*, because her experience with it has been good, with respect to growth of plants. She describes the salient features of the soil as follows:

It basically has ... it has imitated Nature, it has compressed Nature in 200 days, so that soil has all the nutrients and microbes required to grow a variety of plants. Because in making it, a variety of plants have gone into it. Its structure, it has Carbon, because bagasse is used, variety of leaves. It has water-holding capacity, so requires less water. It is more pest resistant. Something in Amrit-Mitti will do better than other soil mixes. It is light to carry around ... (Source: interview)

She recalled specific incidents that led volunteers to discover something new, even if it took the form of mistakes.

Sometimes the volunteers don't know, but we learn this way. Like last year there were lettuces. Aunty Binny said 'cut it, it will branch off like spinach' I didn't know so I did it, but lettuce once cut just collapses! So, yeah we all learn. (Source: interview)

Work and discussions on the farm have helped her become much more health conscious, and she has been trying different recipes shared by other volunteers at home.

Over time she has talked about UF to many people, who she feels get interested because of the connection to growing healthy food. She feels hopeful about terrace farming, because of the growing interest in the idea of fresh produce. She feels that the change needs to start with young children, as they are much more observant and are willing to learn. The enthusiasm of her own daughter serves as testimony of her belief.

From starting as a possible project for her child, she has now moved to an urban farming activist, conscious of the larger environmental effects of her local actions, as illustrated by the following comment.

So, the point is you reduce your food miles by growing some stuff at home. It is your personal choice if you want to eat spinach from market or spinach from house ... but by growing your own food, you are greening your area, adding to the biodiversity ... you should see the bees I have in my balcony ... or other pollinators. It is just not one thing and you are not adding things to the landfill. (Source: interview)

4.1.5. Arun

Arun is in his late thirties, and is currently on a sabbatical from his job at an IT firm. He heard of UF first in 2012, and attended a workshop, but did not become a regular volunteer till 2013. His motivation to become a regular stemmed from his enthusiasm for physical activities.

Like it was a great physical activity. That is what I currently enjoy also. It gets you out of the house. Of course, you can go down jog, to the gym, but here you get to work with your hands in the soil, and it is physical work. And you also, you get to meet people ... (Source: interview)

He also pitches in to organize workshops, and mentioned enjoying the experience and exposure of managing events. He made *Amrit-Mitti* successfully at home, and described feeling happy with the growth of plants in that soil. He has been growing a few plants in his balcony, though space is a constraint.

He felt his time at UF has led him to recognize the value of patience while growing plants, and that one has to understand that things take time. He also felt that the work has helped him realize the inherent value of many things that are normally discarded. He mentioned having a newfound respect for farmers, after realizing how tiring it is to work for even two hours a day on a small terrace space, despite having help from other volunteers. He also appreciates meeting different people, who have provided him with information and knowledge about farming practices. His participation extends to discussions on the WhatsApp® group, where he often promotes workshop and outreach activities.

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

He strongly feels that children should be exposed to farming, especially from the view of respect for physical labor. He also sees it as a valuable way to establish a connection with food and nature.

4.2. Emerging motivation themes

4.2.1. Diverse motivations lead people to join the group

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, that begin from personal interests and slowly encompass wider goals, which become salient through involvement and interaction at the farm.

This evolution of interests suggests that environmental motivations need not stem from altruistic notions (Schwartz 1970; Schwartz and Howard 1981). Instead, larger ecological issues can be assimilated within personal self-interest (De Groot and Steg 2009). The following conversation illustrates this point. Kapur Tulsi (Camphor Basil) cuttings were brought by one participant and grown on the farm. The camphor-like aroma of the leaves led Payal to use them to clean her floor. She later shared her experience with other volunteers at the farm:

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

Another volunteer: What are you using it for?

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

Another volunteer: Really! Does it help?

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

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

Volunteers have also tried different herbal concoctions, such as citronella, lime leaves and lemon grass, all growing on the farm, as alternatives for cleaning chemicals, some of them actively trying to reduce dependence on commercially available ready-to-use products. These herbs are also used for flavoring tea, water etc., replacing commercial flavors.

4.2.2. Joy and ownership developing with competence in tasks

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

I also made amrit mitti at home in tubs after the workshop. It was a great experience. Plants did thrive in that soil. (Source: interview)

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

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

There is a gradual increase in the repertoire of activities that volunteers feel motivated about, and this develops through tangible positive feedback in terms of harvest or encouragement from peers. For example, Aarti attributes her increased involvement in activities to being assigned as an experienced volunteer, which means she is expected to guide the new participants.

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

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

4.2.3. Community interaction as important avenues of learning and motivation

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

A year back we had there was a critical problem then in the sense that the spinach and mustard seeds were getting eaten up by rats. So we decided to make saplings at home instead. I also had a problem of mice at home. So I thought why not make a ventilated box to cover the plant till it grows a bit. I even posted the picture on the WhatsApp® group. That time Pushpa had warned me that the box is made up of acrylic and the heat which the plastic generates may hamper the growth. But I was very confident that there was enough aeration and the plant

would be protected from mice as well. But I was actually proved wrong. It was protected from the mice but the heat from the box did not allow my plant to grow. *It was a great learning experience.* I have still kept the box in the balcony as a memento. (Source: interview)

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

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

4.2.4. Guided attention motivates changes in perspective

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

I didn't think about soil at all. Never thought about soil. It was all about compost ... after doing the Save A Leaf campaign, trying to understand the chemistry and whatever, doing all this, I have a better understanding of soil. And you can make out when you see the difference, like the other day when we were reporting, the bottom soil was red earth, it was hard and soggy, clayey actually, so the roots could not grow. Soil needs fertility, it needs structure and it needs microbes. So that red earth didn't have structure, it didn't have carbon for aeration and all that. So it didn't have microbes ... This is not something I knew 2 years ago. You are learning the significance everyday. (Source: interview)

Participating in the making of *Amrit-Mitti* provides volunteers with a visceral sense of ecological relationships. This sense emerges from volunteers performing different actions still part of life in Indian villages, such as getting cow-urine, cow-manure and dry leaves, molasses and local soil in order to make *Amrit-Mitti*. These actions create a 'coagulative' practice – a set of actions that generate an understanding of the interdependence of elements in the environment, such as the symbiotic relationship of livestock and a farm, and the need for biodiversity for a healthy ecosystem. The term 'coagulative' captures the quality of the practice wherein seemingly different actions are integrated. This coagulation gradually leads to amorphous ideas becoming more substantive and actionable. For instance, the need for cow-manure led to the realization of lack of healthy cows in the city, because many volunteers found strands of plastic in the manure they collected. Such close interactions led volunteers to deeply reflect on their use of plastic, and garbage disposal in their communities. Making *Amrit-Mitti* thus creates various associations between elements that are systematically compartmentalized in an urban set-up, in terms of production, consumption and waste disposal. Growing food thus becomes a part of a larger cycle, encompassing various forms of life, ranging from bacteria to cattle. Another episode on the farm helped reiterate the idea of interdependence embedded in interactions. Nitish, who had been given the responsibility of monitoring health of plants, along with a few other volunteers, noticed caterpillars on the farm. These caterpillars had evidently eaten most of the lilies. His immediate reaction was to consider them as pests, but the ensuing discussion went as follows,

Nitish: We need a solution for these caterpillars. Should we remove them manually?

Another volunteer: At a butterfly garden in Thane (a location in Mumbai), the owner said he plants a separate section of butterfly feeding and host plants and trees. But then his focus is butterflies. What is our purpose? Understanding biodiversity? Or farm-to-plate?

Pushpa: Biodiversity is necessary for having an organic farm-to-plate in a sustainable manner. Sometimes we may feel that a certain pest is taking over the farm completely. However, given time there comes along a predator for it. Pests attract ants, who attract spiders, and insects, who attract birds who manage pest. The food chain needs to get established on a farm. Over time a balance is maintained. So part of what you grow has to be shared with bugs, slugs, snails and birds, as they all play their part in the ecosystem.

Nitish: *Okay, so let us keep observing them.*

Payal: Butterfly season starts end of rains. On farm have seen caterpillars of lime butterfly and lily moths. We are fortunate to see all this unfolding in a concrete city! (Source: WhatsApp® log)

Nitish began tracking the population of caterpillars on the farm, and in the process observed other insects, sparking further discussion on the need for biodiversity. Similar to this case, other phenomena have acquired significance, starting with visual attention, which scaffolds aesthetic and emotional bonds, and lead to further sensitivity towards the environment. This finding aligns with other studies that have explored the role of affective experiences in understanding human-nature interactions (Ulrich 1983).

4.2.5. Influence in values through engagement with community

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

sustainability is all about that, right, you put back what you have taken from the soil. (Source: interview)

Values pertaining to frugality and re-usability are also embedded in the practices, and these were often highlighted while discussing inputs required to make soil beds, and other similar infrastructure. The emphasis on mulching led to active collection of dried leaves, subsequently resulting in a campaign against burning of leaves, which later took shape as a petition for right to clean air. Similarly, pest-predator relationships were often observed as markers of soil health at the farm, and this practice led to volunteers developing critical views of artificial means of removing pests, as well as an understanding of the importance of biodiversity. These examples illustrate the way wider narratives emerge through practice-based embodied interactions.

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

See, this apartment is shared by six houses and initially people were very doubtful about seepage and so on ... Anyway, now they are supportive because I share most of the harvest with them and have given everyone a key to the terrace so that they are free to check and can even take anything they want without asking me ... that is how people get involved. (Source: interview)

4.3. Implications for designing educational interventions

Environmental education is complex, as it deals with a systemic problem that cuts across disciplines, values, societal norms and market forces. It is thus not amenable to reductionist and simplistic causal models, and interventions based on such models. The dominant information-based model of learning has led to a 'patching' approach, where environmental topics are attached to existing disciplinary content. This seems to have created a population of people who are aware, and even concerned, about the environment, but have little idea of possibilities in terms of practice (Ashley 2000; Bonnett 2013).

In contrast, our case studies show that practice-based approaches can encourage systems thinking, and can facilitate the development of a perspective where the environment is seen as a seamless web of relations and processes that affect one another constantly. This perspective can lead to a problem-solving approach termed 'Solving for Pattern' by Wendell Berry, who argues that long-lasting change requires addressing patterns that underlie 'individual problems', and intervening in a way such that a single solution brings together multiple issues. 'A bad solution is bad, then, because it acts destructively upon the larger patterns in which it is contained. It acts destructively upon those patterns, most likely, because it is formed in ignorance or disregard of them ... A good solution is good because it is in harmony with those larger patterns ...' (Berry 1981, 136).

Studies show that first-hand experience of nature contribute to the development of pro-environmental attitudes (Chawla 1999; Bögeholz 2006; Birdsall 2010; Cutter-Mackenzie and Edwards 2013). However, there is relatively scarce empirical work investigating how the processes and variables involved in such activities lead to changes in motivation and values, particularly through interaction with environmental artifacts. Similarly, the role of a community in bringing to fore motivations, as well as unarticulated inclinations, needs further research. Compared to a focus on individual efforts, the exploration of actions in relation to a community has different consequences and interpretations.

The findings from the study point to the possibility of a potential educational design with such characteristics, where community-based engagements nurture desirable actions and wider motivations among student participants. The engagements would be flexible, with broad goals of pro-environmental sensibilities, allowing students to explore and negotiate the significance of various contexts presented to them. Such engagements would also help rethink the popular idea that altruistic notions are the only possible drivers of environmental actions, and raise the possibility of pragmatic concerns grounding environmental actions. This view suggests that everyone could be environmental activists, even though their starting points would be purely pragmatic. The study suggests that interventions could also be more inclusive in terms of participation, as a wide range of activities could contribute to the farming practice (as an example), such as planning, documentation, making compost, plant health and seed saving.

5. Discussion

The participatory study reported here provided insight into changes in individual volunteers as they began seeing their agency in growing fresh food. A 'personal transformation' is generated by the values 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 related work, social practice theory looks at practice as a unit of analysis, where 'doing' things is an important component of transforming behavior, which is facilitated by interactions within the community. Lave and Wenger (1991) studied various communities of formal and informal apprenticeship, and provide an account of the community acting as a 'living curriculum' to disseminate knowledge among the participants, as they negotiate their way to become skilled practitioners. Our work shows that apart from knowledge, a practice also embeds certain normative views about the world, and thus contribute to the values developed by participants.

Hargreaves (2011) explored behavior changes in employees of a construction company that had endorsed an 'Environment Champions' initiative, which consisted of taking an audit of environmental impacts of the organization, and implementing actions that could reduce the impact. He observed how certain practices came to be valued and discussed amongst employees, and how inter-personal monitoring made sure no one backtracked. Such community-based monitoring of sustainable practices is also discussed by Ostrom et al. (1999) who studied how resource commons can be fairly shared and

sustained if there are personal interactions within the community, which allow for continuous feedback about one's actions.

In our study, we 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 provide a positive motive to explore more actions in related areas, and an increasing number of concerns start making sense in relation to this growing process. This expansion of personal interests in turn drove further actions, thus creating a positive feedback loop between motivation and action. This was clearly seen during the 'Save a Leaf' campaign, which was initiated by volunteers to collect dried biomass for composting, and subsequently took the shape of 'right to clean air' when they discovered that leaves were being burnt at various localities. Sustained actions, enabled by performative and coagulative substances such as *Amrit Mitti*, evolve into narratives that support values such as frugality and reuse & reduce. This is similar to the spill-over effects described by Thøgersen and Ölander (2003) who suggest that there is a likelihood of performing related behaviors in a cluster, such as re-cycling and careful consumption, especially if they contribute to one's social identity.

The relationship between community practices, individual actions and evolving values, 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 motivation and development of values, capturing how practice-action-motivation feedback loops coalesce into values (Figure 2).

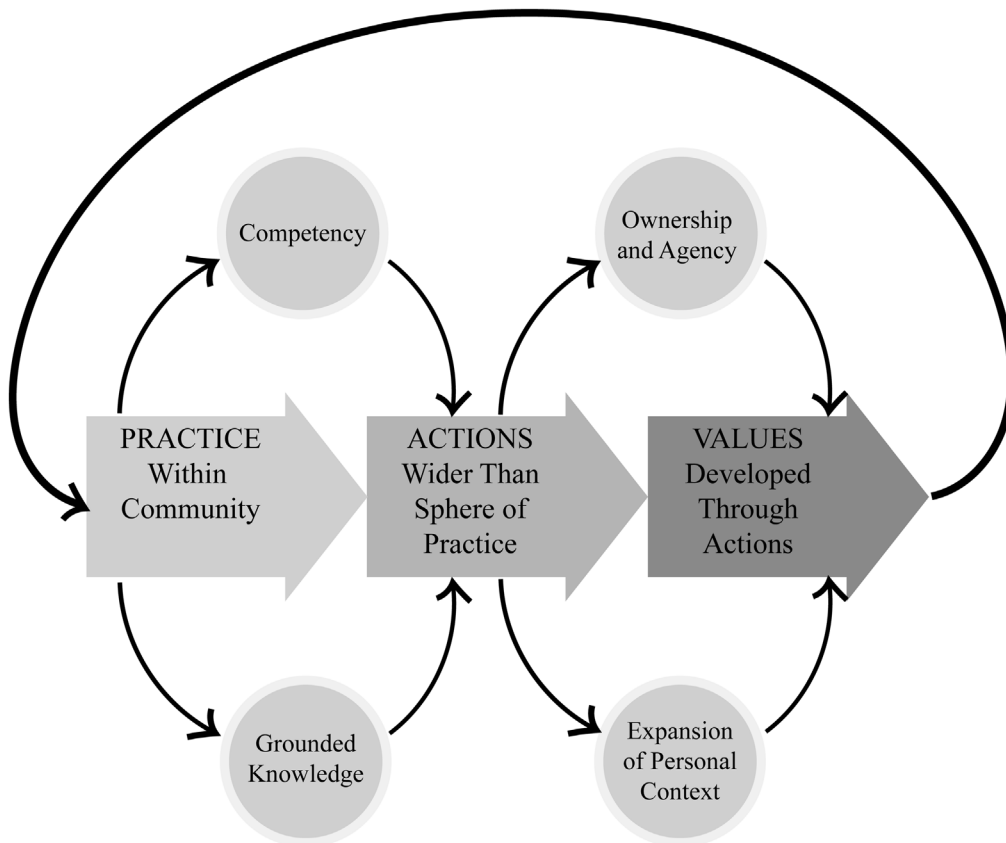


Figure 2. A model of how values coalesce from 'embodied' actions performed over time. In this context, wide-spread actions away from the site emerge because of the nature of growing plants.

This model is in alignment with studies in cognitive science which report how interaction with physical artifacts critically change the cognitive processes of participants (Hutchins 1991; Nardi 1996). Our work extends this theory to include values, which are revised through interaction with artifacts of practice. Farming, particularly as a community practice, offers 'performative-substances' which help coagulate various environmental themes into values, and can thus provide engagements that lead to development of resilient environment-oriented communities.

Since this model is a general one, it raises an interesting question: would every embodied experience generate values and motivations? We would like to answer yes, speculatively, to provoke discussion on this point. The reasoning for this answer is as follows. Since every practice requires some kind of embodied experience, we expect that every practice would generate values and motivations implicitly. For instance, spoken language and writing practices generate their own value systems (Ong 2013). However, the values generated by these and similar practices would not be similar to the ones generated by the farming experience. If the nature of the practice is linear, modular, and transactional – as in the case of assembly-line-based practices and modern technology-based practices in general – the values that develop implicitly would also have a similar linear, modular and transactional nature. This structure (linear, modular, transactional) is dominant in most modern practices, as this structure is required for achieving economies of scale and generation of surplus capital. From the standpoint of our model, this all-pervading structure accounts for the dominant value system towards the environment, which is also linear, modular and transactional. In this view, 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. Embodied and ecological practices such as farming allow the internalization of the integrative and interdependent nature of ecological relationships.

More empirical work is needed to refine this model, and develop constructive critiques that illuminate the complex relation between grounded practice, artefacts, actions, and values. We expect our further studies, based on a school intervention, to contribute to a more detailed characterization of this model, and also help redesign the intervention, through a design-based approach (Cobb et al. 2003). We believe designing practice-based interventions based on this model can lead to transformative EE, promoting widespread environmental actions. The role of farming in developing pro-environmental values needs to be further explored, particularly how it helps in experiencing nature through a relation of embodied reciprocity, rather than the passive observation promoted by current information-based approaches to EE. More importantly, such studies can help formulate policies that can support sustainable practices in urban areas, lowering environmental impact and developing more resilient socio-ecological systems.

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No potential conflict of interest was reported by the authors.

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