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MARKUS WERNLI

Adventurous Homemaking: Exploring Collaborations toward Agroecological Probabilities

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This research investigates how attending to the basic needs of human bodily existence is mobilising transpersonal abilities toward integrative flourishing. Rearranging human-environment relations through the self-contracted crafting of daily life, requires courage, bodily engagement and failure tolerance. Through contemporising the co-regulating exchanges of fermentation, this study engages people's bodyminds as biophysical agents in socio-natural ecologies which starts with their digestive byproducts—human 'waste', whereby human 'waste' becomes an integral element inside a self-contracted goal pursuit. This study evaluates self-mobilisation strategies and social buffering dynamics that assist people to commit to and prosper vis-à-vis adverse situations. A series of provocative human 'waste' upgrading events formulated a collective domesticity study where 22 participants participated in fermenting urine for growing edible plants and entering (biological) circulations of well-being. The dynamic tension of jointly encountered ambiguity together with the integrative goal created a failure-friendliness that was conducive to sociality, inventiveness, and rich emergence of meaning.

School of Design,
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ADVENTUROUS HOMEMAKING:

EXPLORING COLLABORATIONS TOWARD AGROECOLOGICAL PROBABILITIES

M A R K U S W E R N L I
PhD

The Hong Kong Polytechnic University

2020

THE HONG KONG POLYTECHNIC UNIVERSITY
School of Design

Adventurous Homemaking:
Exploring collaborations toward agroecological probabilities

Markus Wernli

A thesis submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy

January 2019

CERTIFICATE OF ORIGINALITY

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MARKUS WERNLI (Name of student)

A B S T R A C T

Adventurous Homemaking:
Exploring collaborations toward agroecological probabilities

This research investigates how attending to the basic needs of human bodily existence, is mobilising transpersonal abilities toward integrative flourishing. Rearranging human-environment relations through the self-contracted crafting of daily life, requires courage, bodily engagement, and failure tolerance. Such adventurousness is the crux for inhabiting the world in ways that nurture the biophysical foundation of human existence. Through contemporising the coregulating exchanges of fermentation, this study engages peoples' bodyminds as biophysical agent in socionatural ecologies which starts with their digestive byproducts—human 'waste'. Advancement in wicked problems depends on confronting challenges deliberately for suspending the operational logic behind them. In response, this study evaluates self-mobilisation strategies and social buffering dynamics that assist people in committing to and prospering vis-à-vis adverse situations.

A series of provocative human 'waste' upgrading events formulated a collective domesticity study where 22 participants implicated themselves in fermenting urine for growing edible plants and entering (biological) circulations of wellbeing. When technical breakdown made it futile to grow anything, participants persevered remarkably in an all-hands-on-deck collaboration. The dynamic tension of jointly encountered ambiguity together with the integrative goal, created a failure-friendliness that was conducive to sociality, inventiveness, and rich emergence of meaning. To visualise the participants experiential journeys, a rendering model was developed for correlating self-support and societal internalisation with adeptness to the turbulent situation. The psychodynamic tracking indicates how the vibrant work alliance provided ample social porosity and multidimensional impetus to participants. Human 'waste' became an integral element inside a self-contracted goal pursuit. Close attention to mutual ephemerality became the catalyst for deeper insight, solidarity and greater choices through engaging in body-aware exchanges with their environment.

Keywords: *radical homemaking, human 'waste', upcrafting, communal engagement, collaborativeness, integrative biopedagogies, ability-orientation, new social design.*

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Markus Wernli, Hong Kong, January 2019

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Existential Reconciling

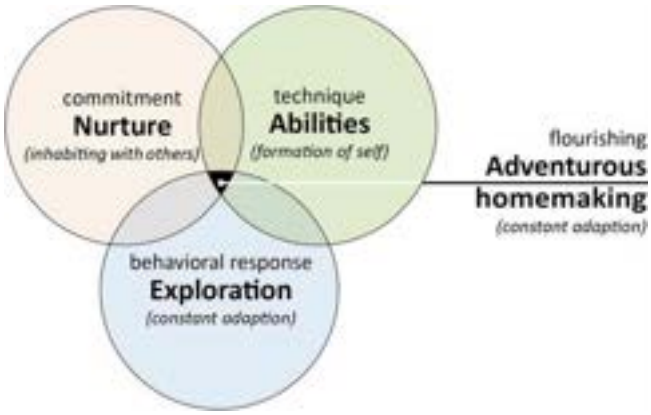
Can we reorganise ourselves so that […] what we eat and how we handle our shit are essential acts of citizenship, as important as how we vote?
—David Waltner-Toews (2013:189)

The quote above is a call to reappreciate the social and biological functioning of the human organism. Contemporary life tends to discount the abilities of the mere body by over-estimating the importance of the mind, which seemingly transcends the biophysical foundation. In this suppression of animality – susceptibility for emotion, frailty, interrelation – humans are removing themselves from the life-supporting exchanges crucial to integrative flourishing. This study concurrently approaches the two primary support ecologies of *eating* and *sensemaking*. Such body-centring mobilisation naturally declares the home – the domain of daily self/other nurture – as the origin and destiny of sociotechnical adventures.

Reconciling existential needs with the unpredictability of the present situation is the driver of this research. Relatively little is known about the inner workings of nutrients cycles (in soils and waters) and failure-tolerant learning alliances (in humans). In response, homemaking is reconsidered as competence-expanding, social experimentation by articulating the adaptive dynamics involved.

Adventurous homemaking seeks to instil the coevolutionary potential in people and their environment based on the three elements shown in the following Venn diagram (figure 1): ecological commitment (nurture for other) which is orienting human abilities (formation of self), and spurring exploration (response dynamics). As described inside this thesis, adventurous homemaking can have critical relevance inside the bathrooms of Hong Kong tower flats; or interplanetary settlements on Mars.

(figure 1) **Explorative research on existential formation and nurture**



This research engages with commitment, technique, and people, to heighten sensibilities for their impact on behavioural responses, group dynamics, and the natural world.

Sensemaking in sociotechnical experimentation: Research into the interdependencies of the body, food, adaptation and thriving requires reconciling craft with pedagogy, science with the everyday. For evaluating alternative homemaking scenarios and their experiential properties like sensation, or regeneration, this study adopts an *applied research* approach (Buchanan, 2001). Essentially, the entire society is considered here as a huge laboratory for "sociotechnical experimentation" as proposed by Ezio Manzini (2015:53) for elevating the home into a site of social learning:

> [it] is a broad, complex *social learning process*, by which everything that belongs to the mainstream way of thinking and behaving in the old world will have to be reinvented: from everyday life to the very idea of wellbeing (Manzini, 2015:53).

Reinventing home life and conceptions of wellbeing requires bringing complex problems back into a shared action space (Lindström & Ståhl, 2014). Inventive learning stems from engaging people with different abilities, which makes this research fall into the category of design collaboration (Kvan, 2000), with an inclusive process of "unpacking the concerns" (Huybrecht, 2014:106) of people. The purpose of this working alliance is to gain knowledge through design-led experimentation, therefore it constitutes *research through design* (Findeli, 2015; Frayling, 1993).

Inhabiting the *world of eaters*: This study attempts to nudge homemaking practices in relation to the natural world. The aim is to re-engage the bodyminds of people with biophysical exchanges that embeds them into a living, overarching presence, akin to Maurice Merleau-Ponty's (1968:248) "flesh of the world":

> … my body is made of the same flesh as the world […], moreover, this flesh of my body is shared by the world (Merleau-Ponty, 1968:248).

This bodymind coming to life from its interrelations, is a fully implicated member of what Melanie DuPuis (2015) calls the "world of eaters"[1]. Since all life forms are literally eating on each other for sustenance, humans' metabolic byproducts – faeces and urine – are by virtue the socionatural token in primordial exchanges as Joshua Ozias Reno (2014:18) illustrates:

> … mass waste management […] has obscured how […] all wastes serve as means of exchange between living forms. [It] has done so by making it seem as if risk to humans and environments is their primary meaning (Ozias Reno, 2018:18).

Reconciling mental misconceptions with biological purpose begins with language—the way we refer to these life-serving 'wastes'. The dilemma is that existing terminology is either too crude or too technical but hardly neutral. Thus, the term 'waste' is kept in apostrophes throughout this text, as a semantic marker of how human 'waste' is a mere social construction. With adequate handling (Waltner-Toews, 2013), all biodegradable residues are the life currency in the *world of eaters*. Reconciling language, meaning and 'waste' handling, is just the beginning of a much larger adventure, as Cameron Tonkinwise (2013) indicates:

> Developing more sustainable societies is not just something that can happen through a few top-down decisions. It is something that will involve changes to nearly everything every one of us does each day: what we have for breakfast and how it got into our homes, how we clean our teeth and where our waste water goes, what we wear and how we care for our clothes (Tonkinwise, 2013).

Many thinkers agree how upgrading tooling alone does not adequately address the issues underpinning the mounting ecological challenges, since logistic measures protract the long-term environmental costs and remove people further from their biophysical foundation (Escobar, 2018; Wahl, 2016; Manzini, 2015; Fry, 2009). There is a demonstrated need for

[1] In this **"world of eaters"** (DuPuis, 2015) people are intrinsically engaged with the complexity of the world by way of digestive and fermentative conversion processes. In such a reframing, the food consumed is made absorbable to the human organism by nonhuman gut bacteria that eat it themselves. In this conception the human consumer is constituted by what is eating inside of them, and conversely, they feed what is feeding on them. By virtue, in a 'world of eaters', human excrement finds appreciation as the most valuable socio-natural material in vital energy transfer between biological ecosystems.

more bodily enabled, participatory methods in urban food production and ecosystem services to keep up with environmental degradation and growing urban populations (Fry, 2017; Viljoen & Bohn, 2009). Greening cities and growing food with smaller ecological footprint – by minimising petrochemical and mechanical inputs – would necessitate the agricultural participation from much larger parts of the population (Otterpohl, 2017).

New ways of investing people in the nourishing of the living environment are needed. In what Michael Carolan (2016a:143) refers to as "deep commitment" he advocates co-experimentation with (in)animate materiality that is feeding and supporting humanity, expressed in a profoundly relational understanding of the world:

> Somebody is deeply committed when contributing is grounded in materials and relations inside the lived, non-representational world of the everyday' (Carolan, 2007:1274).

Materials and relations in the *world of eaters* are held together by the impulses of its homemaking members. A deeper commitment to a *world of eaters* is then about reconciling non-representational daily life with the coordinating rhythms of growing seasons, local demands, and personal motivations (Carolan, 2016). In this view, the medium of relationality then is the cultivation of coordinated movement[2] across the compost, the group, and people. For loosening up sedentary lifestyles and linear fixations (Gladwell, 2017; Kohn, 2008:15), this study is investigating the motility potential from organic 'waste' and social arrangements for unleashing the flourishing potential (and nutrients) already inherent in people and the environment.

[2] In his article titled ***Shame and Pelvis*** (2017) yoga instructor Christopher Gladwell reflects on how dwelling in chairs is increasingly debilitating people. Sitting is collapsing the front line of the body – between the pelvis and heart – into gravity, thereby blocking vital flows of energy. Referring to traditional Chinese healing practice (Kohn, 2008:15), inhabiting this pelvis-heart line, known as *dantian* 丹田, is best accomplished by squatting (referred to as *powerful pose* in yoga). This old-style movement medicine – integral to practices like tai chi or old-style squatting toilets – invigorates the pelvic floor, deepens breathing, and is conducive to libidinal vitality. Remobilising the pelvis area also helps people to liberate themselves from shame, which is crippling to intimacy and creativity as indicated in the work of vulnerability researcher Bréne Brown (2012). Last but not least, conscious squatting also produces excrement that is meant to contribute to overarching, digestive ecologies.

1.1 · Defuturing translocations

In the *world of eaters,* the biological role of animals (including humans) is to return excess nutrients to the soil, along with undigested seeds for the proliferation of biomass. When nomads became city dwellers, when production moved from home to factory, when the homesteadying provider became labour-selling consumer, (human) animals vastly stopped replenishing soil ecologies (Waltner-Toews, 2013). Nowadays human 'waste' has become part of a massive, global translocation of feeds. The nutrients, water, and energy extracted from an ecosystem on one side of the world, are transported as packaged crops or food across the world, then consumed, and eventually deposited as excrement into ecosystems on the other side of the world. While these effluent nutrients lead to toxic manure lakes, suffocating water bodies, and potent greenhouse gas emissions, the petrochemical fertilisers applied to soils do not sufficiently replenish them (Cohen, 2007; Thunder, 2015; Waltner-Toews, 2013:120).

This biophysical translocation combined with short-sighted, inconsiderate management is depleting the soil world-wide and leading to compaction, erosion, contamination, and salination. Over time, the result is a loss of fertility, a lack of micro-nutrients in food, and a drastic reduction of biomass and biodiversity. At the current rate of soil degradation, the UN's Food and Agriculture Organisation (Arsenault, 2014) predicts that conventional farming practices may only be viable for another 60 years, since the natural generation of topsoil requires about 1,000 years. Notably, the microbial relationships in humus are still largely unknown; another sign of how undervalued soil is (Brussaard et al, 2007; DuPuis, 2015).

Thriving, humus-rich soils are essential for human economies in the production of feed, fibres, and fuel. Yet, more crucially, they play a vital role in Earth-wide ecosystems. They host the bulk of microorganisms, the invisible movers and shakers of life. They regulate the water cycle through absorption of floods, storage and filtration. They act as potent carbon and greenhouse gas sinks to mitigate climate change. They even store and supply oxygen (Hakan, 2014:79). Graham Harvey (1998) already noted how society's fate stands or falls with this indispensable superorganism, reminiscent to a planetary skin:

> It remains the sobering fact that even in the age of global communications and the internet, civilisation continues to depend on a few inches of topsoil for its very existence (Harvey, 1998).

The interface between topsoil and humanity is *agriculture*—this Latin word, links *agri* for 'ground' with *culture*. Until the 16th century, the meaning of *culture* was directly tied to *agri*-culture. Only when the ground was made fertile through adequate husbandry, craft and education could work to improve the mind. It made sense to mentally ingrain civilisatory potential onto nurturing the superorganism it depended on. Only recently, agriculture took on its figurative sense and increasingly contesting its relationship to the ground.

Agriculture of domination and integration: Every household in the *world of eaters* plays an active role in the biophysical restructuring of the planet (with unforeseeable consequences) because it is "the transit station for materials, skills and ideas" (Perolini & Fry, 2012). Disregarding long-term needs and satisfying immediate wants contributes to a structural unsustainability Tony Fry refers to as "defuturing" (Fry, 2009). When livelihoods, infrastructures, and markets are systemically breaking biophysical circulations, then every homemaker becomes an enabler of a destructive trajectory that diminishes potentials and choices of future homemakers. Conversely, agriculture and homemaking that contribute to soil stewardship can be considered "futuring" efforts.

Recent developments in food production increasingly shift from agricultural to agritechnical and are removed from the soil altogether. In a quest for efficiently feeding megacities in the face of a destabilising world, interiorised and vertical agritechnology is "turning farming […] literally on its head" (Carolan, 2017:132). With full climate control, photosynthesis-optmised lighting, and chemo-nutrients formulated for each plant variety, crops grow in water (or air) twice as fast as conventionally[3]. While such growing facilities (hydroponics or aeroponics)

[3] **Hydroponics** gained immense importance through the Fukushima nuclear disaster in Japan's agricultural heartland. It triggered large, electro-chemical corporations to develop hermetically contained, controllable indoor growing factories powered with organolight-emitting diodes (OLEDs), aeration system and computer monitoring to make food supply "as reproducible as possible". Hydroponic designers are able to configure taste, bite and appearance of plants like never before (Kwekerij, 2016). Experiments with artificial intelligence and farming robots in hydroponic facilities are ushering in new forms of unmanned agriculture (Carolan, 2016b:148). Hydroponic is also a game changer in indoor home growing. IKEA launched in 2016 several rack-sized, hydroponic vegetable incubators for dark flats in dense megacities. Michael Carolan reports how "hopeful, hydroponic-inspired, agrifood futures" have become part of the maker culture in the United States (2016b:141). Growing (more or less) legalised plants without soil and backyard, in the privacy of the spare bedroom or basement, is here considered liberating.

minimise the use of space, water, pesticides or foodmiles (Finetto et al, 2015), they do not provide any ecosystem benefits. Its reliance on external resources and waste output, is actually contributing to the translocation and defuturing trajectory.

Reconciling water-based planting with organic 'waste' integration is a tall order without soil's mighty microorganisms. Efforts are underway to integrate foodwaste, fish excretions, compost leachate or even urine into water-based farming (aquaponcs, bionics). Yet, maintaining the microbial health in these hybrid systems is proving difficult (Sanchez & Hjelm, 2016), in part because there is a clash of paradigms. While the latest argritechnology emphasises sterility and dominance, integrative agriculture is reconciling the given condition with a myriad of agents. Fermentation revivalist Sandor Katz (2016:6) points to the significance underlying people's engagement with bacteria in foods and soils.

> We use the same word – culture – to describe the community of bacteria that transform milk into yoghurt, as well as the practice of subsistence itself: language, music, art, literature, science […] all that human beings seek to perpetuate in our varied and overlapping collective existence (Katz, 2012:6).

The proposition to infuse *culture* to the soil and collective reality is setting the stage for this study. Cultivating socialties around the world of bacteria is the opportunity to relate people to their imperfect, frail, inconclusive, other-dependent selves. Veterinarian and epidemiologist David Waltner-Toews (2013:14) indicates the importance of reorganising life to re-relate to our essential biological selves, including the wondrous chemistry of people's animality.

> If we allow ourselves to better understand the substances emerging from us, from all animals, as an ecologically unifying principle, going back to our evolutionary origins and the roots of our belonging, then we can, with serenity and happiness, deal with all the shit that surrounds us (Waltner-Toews, 2013:14).

The conventional narrative – narrowly focused on safety and purification – conveniently excludes the long-term dangers. It led to the detrimental silo mentality that disconnects agriculture from sanitation, production from destruction, humans from humus, mind from body, and rationality from relationality (Overhill, 2018; Otterpohl, 2017; Stevenson, 2016; DuPuis, 2015; Waltner-Toews, 2013).

1.2 · Reclaiming digestion

In the *world of eaters*, the unifying imaginary is digestion. The fact that gut bacteria are the First to eat what has been ingested to nourish the human organism, tells the story of intricate alliances between food systems and inner ecologies (DuPuis, 2015:146). It departs from the notion of an intact self. With a body constituted from a collaboration with a multitude of life forms, digestion is the narrative of a reality made possible from productive mixings and the inherent unpredictability this process entails. Fermentation – the crafted expression of digestion – is then a mode of acting as part of, rather than shielding from, the worldmaking in and around us.

> Fermentation opens up the world to the outside, but avoids the chaos of disorder. Chaotic fermentation just leads to a bigger mess. Good ferment requires good processes. Fermentation is therefore not a metaphor of anarchy but of governance, of founding new ways of collaborating (DuPuis, 2015:157)

Fermentation is the openly social collaboration between domesticated microbes and humans leading to fertile contamination. This coevolutionary metaphor is also applicable to intraspecies dealings of humanity. It reminds people how they live with the consequences after choices have been made. Living with one's choices is to face the mess – like path dependencies of conventional agriculture or purification treadmills – and work through it as partners in a coevolutionary dynamic.

Recently, architects, designers, artists, and planners are partnering with scientists and engineers employ the fermentation paradigm – materially and conceptually – to confront the mess of biophysical translocations. Under the influence of accomplishing the Sustainable Development Goals for water supply and sanitation by 2030 (Rosenqvist et al, 2016), creative initiatives to synergise sanitation and soil stewardship are being implemented on a small, communal scale—not just in the Global South.

A combination of weather extremes, acute water shortage and rapid soil depletion in Germany, have in the past decade brought designers, ecologists and farmers together to contemporise a fermentation method that reintegrates organic 'waste' into local soil ecologies for sensibly boosting their resilience (buffering capacity). This resource cultivation

is a known as Terra Preta do Indio[4]. *Terra Preta*, from Portuguese for 'dark, humanly-generated soil', was discovered in the 1980s in the Amazon basin. What is remarkable about these Black Soils is their self-accumulation of organic carbon and fertility (into biodiverse hotspots) over centuries, unlike the impoverished soils common to the region (Carolan, 2017a:14). Pre-Columbian populations were only able to maintain prospering megacities inside the fragile biosphere once they mastered the complete reintegration of material circulations—including human 'waste' (Krause & Jacobsen, 2011; Lehmann, 2007).

At the Botanical Garden in Berlin, the Terra Preta Sanitation method[5] has turned public toilets and garden operations into a profitable resource provider. Next to self-sufficient humus generation, the garden sells thermic energy from the biomass upcycling to residences nearby (Wagner & Suer, 2015). Similarly, the Terra Preta public toilets at Hamburg Central Station; turn human 'waste' into fertiliser to improve sandy soils in the region (Bettendorf et al, 2015).

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[4] The contemporised version of **Terra Preta do Indio** entails the diversion of urine and the addition of charcoal dust know as biochar. Infused with lactic acid bacteria the char the biomass is first fermented, then vermicomposted. The fermentation with lactic acid bacteria is a stabilising, pre-digestive treatment in sealed vessels, making the method suitable for in-house collection of human 'waste' in urban areas and public toilets. Fermentation here ensures that gas and odour emission are minimised. The consequent vermicomposting is an aerobic decomposition process employing earthworms and mircoorganisms. Pathogen elimination is achieved through acidification in fermentation stage, heat release in composting stage, and year-long storage (Krause & Jacobsen, 2011). Due to non-compostable contaminants like microplastics and heavy metals, the resulting humus is best used for non-alimentary cultivation (greening, landscaping, decorative planting, fibre crops, reforestation).

Biochar is generated from woody residues through thermochemical reaction in absence of oxygen. In this 'wood-boiling' process known as carbonisation or pyrolysis, the carbon that is fixed by plants through photosynthesis remains locked up (sequestered) for at least several centuries, potentially longer (Verheijen et al., 2013). To stimulate plant growth (biomass production) this hyper-porosus char needs to be applied with organic nutrients to be able to mobilise microbiota, store excess nutrients and regulate moisture. As a multifunctional buffer, biochar reduces the need for fertiliser and irrigation and can increase carbon storage capacity over time (Lehmann, 2007).

[5] The **Botanical Garden in Berlin** integrates all human 'waste' from its visitors together with plant clippings and the addition of carbonated wood residues into humus for its horticultures. This holistic resource cultivation became profitable after seven years in operation since it cuts costs on growing medium, and generates revenue from excess energy of its biochar production that is heating residences around the garden (Wagner & Suer, 2015).

At the toilets of **Hamburg's Central Station**, all human 'waste' is destined for agricultural use. The toilet fixtures are engineered for minimising flush water use so that comfort standards are identical to conventional toilets. The urine is diverted to allow separate in-vessel fermentation for liquid and solid biomass in the basement below the toilets. The filled vessels are composted at a soil yard outside of town and stored for up to ten years (Bettendorf et al, 2015; Schuetze, et al 2013).

In Zurich, mobile sanitation service **Greenport** is a startup business that dispatches fermentation-powered, urine-diverting collection toilets (dry toilets) on mass events. The faecal matter is processed into rainforest soil to replenish animal habitat at Zurich Zoo. The urine is 'distilled' by the Swiss Aquatic Research Institute and marketed as liquid garden fertiliser by the name Aurin (Sturzenegger, 2017).

In Terra Preta Sanitation (akin to most resource-oriented toilets), urine is collected separately from faeces[6] for optimal fermentation result and emissions reduction. Since most humanly released nutrients (like phosphorous) are concentrated in urine, it increasingly is a valued fertiliser, especially for animal feed production or decorative planting. Urine recycling initiatives around the world utilise stabilisation and purification technologies that rely on electricity or chemical input—pristine, external resources[7]. Fermentation in contrast, runs simply on indigenous bacteria and molasses, a 'waste' residue from sugar production—underutilised, internal resouces.

With ample resources of released by human bodies and sugar factories – seemingly inevitable in the current economic arrangement – there is a political mandate to explore bottomup alternatives toward more futuring based dealings with biological 'waste':

> When the big, centralized food and opinion producing systems are going to fail us then renewal will be possible if smaller-scale, integrated, inventive, diverse [human] animal and shit-management systems are already in place (Waltner-Toews, 2013:140).

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[6] **Diverting and reclaiming urine:** Source-separated urine is essentially sterile and relatively easy to recycle compared to faecal matter. Smallholder farmers in the Global South are long aware how industrial fertiliser do not sufficiently replenish organic components and micro-nutrients, leading to nutrients-deprived soils and foods (Kumar, 2003). If diverted, stored and applied to absorbable humus, the excess nutrients in urine per year and capita are sufficient to grow about 230 kg of cereals (Heinonen-Tanski, Pradhan, & Karinen, 2010; Wolgast, 1993). The minimal requirement is to store the diverted 'liquid gold' for one month (for nutrients mineralisation), before applying as fertiliser with twentyfold water (Carolan, 2016b:252). In contact with air (during storage), urine oxidizes leading to the notorious ammonia smell (hydrolysis) and loss of nutrients. While the biochemical makeup of urine has too much variables and complexity to be fully useful in industrial fertiliser, yet in response to depleting phosphorous stocks, costly nutrients extraction systems for urine and sewage treatment exist (Cordell, Drangert, & White, 2009).

[7] **Cavern-stored urine fertiliser in Sweden and China:** In the Global North, Sweden has the most advanced urine reclamation, mostly for feed production. Numerous apartment blocks in rural areas have urine-diversing toilets. The urine is collected in underground storage tanks and pumped out by local farmers in road tankers (Richert, Gensch, Jönsson, Stenström, & Dagerskog, 2010). Similar urine utilisation is implemented in China like the city of Dongsheng (东升镇), where several hundred apartments in multi-storied buildings are equipped with urine-diversion toilets (Kumar, 2003).

Pasteurised urine fertiliser in Brattleboro (VT), USA: Since 2012, the Rich Earth Institute, an interdisciplinary research consortium in rural Vermont, has established a 'urine depot': Donors can obtain 16-liter plastic jugs that serves as waterless urinal. It is equipped with an odour-blocking funnel and a sleeve to veil the jug's contents for increasing acceptance. The urine is pasteurised (high-temperature treatment) to minimise storage time and convert organic compounds instantly into plant-available nutrients to fertilise forage crop for animals. (Bailey, Nace, & Noe-Hays, 2015; Barclay, 2014).

'Distilled' urine fertiliser in Dübendorf, Switzerland: Collected from urine-diverting, mobile toilets (Greenport, see above), the Swiss Aquatic Research Institute is processing a comprehensive fertiliser product from urine with addition of magnesium (for solidifying phosphorous into struvite) and powdered activated carbon (PAC) for absorbing pharmaceuticals before it is vaporised. The 'Aurin' fertiliser is authorised by the Swiss Ministry for Agriculture for growing flowers, ornamental plants and lawns (B. Etter, Udert, & Gounden, 2015; Bastian Etter, 2016).

Reclaiming digestion, understood in this study as socially activated fermentation, is not confined to the school, wet lab, gallery, or biodesign studio (Kuznetsov et al, 2012; Myers, 2012). Rather, it builds integrative alliances which bring biologically existential being, doing and knowledge-making into the wilderness of daily life. Such collaborative experimentations are messy, unpredictable, and prone to failure—even with good processes in place. Here lies the crux of this research. Precisely confronting these challenges is the opening potential for inventiveness and capacity – beyond mere tooling – in people and knowledge.

1.3 · Inhabiting adversity

'Adversity' derives from the Latin word *advertere,* for 'turning toward'. Encountering the unpleasant then is about how it is confronted. Ramifications attended to (turned toward), likely ensue more adept responses. Adversity 'turned away' is not a going away from, but rather leaves a looming, disassociated threat in the illusionary distance. In what Tony Fry (2005:199) refers to as "crisis of crisis" is the avoidance of confronting the human role, vis-à-vis the unsustainable condition:

> There is no place to hide, no home to go to from which the unsustaining world can be shut out—it dwells in our dwelling, it dwells in us (Fry, 2005:199).

Addressing the root cause of unsustainability is then a matter of 'turning toward' the operational logic (or unlogic) at play in human interactions with the world. Fry (ibid) indicates how unless this *modus operandi* is confronted, any new agendas or practices cannot deliver the profound socioeconomic reorganisations required. Design then is not about productivity, but is instead a conscious engagement practice led by foresight:

> Design is fundamentally not about bringing something into existence (which it incidentally does) but rather, the giving direction via its efficacy. (Fry, 2005:199).

This study is pulling adverse issues – in good taste and company – back into the consciousness of daily life, thereby turning to a 'wicked problem' otherwise easily fended off. This way previous design directions taken, can be unpacked for doing things differently, for refering back to modus operandi and human self-understanding.

1.3.1 · Neglected importance of body-aware practices

Heidi Overhill (2018; 2015; 2012) argues how humanity's detrimental disconnect from its biophysical foundation stem less from arrogance, than from negligence for its existential, body-related needs. She points out how much of design research over-estimates the significance of the brain, while discounting the abilities of the body. As a result, the apparently immaterial impact of seemingly almighty human intelligence is commonly prioritised over primary, existential concerns:

> … we don't properly appreciate our own bodies, let alone those of other living creatures. Minds desire corporate profits, but bodies need clean air. If we properly acknowledged our whole selves, we would design for the animals we really are, rather than for the brains we imagine ourselves to be. This might be an excellent starting point for acknowledging the needs of other animals as well (Overhill, 2018).

Extending the existential abilities of people asks for more of them to employ body-aware practices. Alternative homemaking then brings the human into a functioning (adversity negotiating) relationship between self and otherness. Insightful for this homemaking research is Emmanuel Levinas' conception of realising the self in otherness. Proposing the notion of *inhabiting*, he departs from the idea of *dwelling* as the being in the world in some kind of enclosure; and living in a sphere of perceived self-sufficiency. Rather, Levinas' writings concerned with homemaking "presuppose a hospitable opening to an other who is beyond any 'its other'" (Derrida, 2002:364). Cultural geographer Paul Harrison (2007) explains how Levina's philosophy is not unfolding *in* but *with* the world from a mutually engaging connectedness both to self and otherness:

> The self [that is] realising or acceding itself […] is a form of rapport: a profound solitude of intimacy, the very event of a primary and radical pluralism. In this recasting of the relationship between the inside and outside, interior and exterior, such that it is based not upon a logic of sovereignty, exclusion or absorption, but on heteronomy (Harrison, 2007:643).

The *Levinan* homemaker here is at the same time hosting the solitude of self with constant concern for being hosted by otherness. *Inhabiting* then is about the flexing the boundaries of what is subjective, social and significant, as a means to enliven relations between people and the environment. Turning to the needs of the body in decision-making brings forth the ruling self that is simultaneously ruled by others—the integrative flourishing rooted in codependency.

1.3.2 · Inhabiting adversity as social ability building

Both Michael Carolan (2007) and Daniel Wahl (2016) indicate how inhabiting adversity is rooted in collaboration and deep commitment. Yet, often pro-environmental initatives are targeted narrowly at individual behaviours or agenda setting. In contrast, this study is invested in what Melanie DuPuis (2015:147) calls “digestive subjectivity”. The endorsement of people who are willing to reconceive society as constituted by curiosity and collaboration, rather than by the unhelpful duality of inclusion and exclusion.

Similar to soil bacteria that is poorly understood, there is little knowledge (in participatory design and beyond) about the wondrous world of human alliance building, about facing ambiguity or failure together, or about the unpredictabilities involved in collective decision making processes. This research explores approaches for this *digestive subjectivity* to emerge in relation to the signification of the person in the context of daily life.

If human ‘waste’ is viewed as the dangerous outcome of polarised, social arrangements, then the question is how can design, that is *inhabiting* adversity, build concern, gather momentum, and proliferate expertise, in order to make collectively better decisions. The overarching question pursued in this thesis thereby seeks to leverage existential abilities in the face of adversity:

Reorganisation from self-commitment: *What collaborative craft approaches can foster acceptance and deeper commitment in urban residents, required for engaging with urine (and potentially faecal matter), as an opportunity to relate to the biological self and environmental otherness?*

Nudging daily routines, engaging with vibrant materiality, entering ambiguous alliances, and collaborating with unlikely partners (as a consequence of self-commitment) is likely to trigger resistance, prompt obstacles, or lead to complete failure altogether. The two sub-questions explore how such adventurous homemaking – despite its uncertainties and messiness – can entice and maintain motivation in participants:

- **Concerning acceptance** (persuasion): *What material and reskilling practices can aid in overcoming stigma and disgust toward human 'waste' and make it possibly desirable?*
- **Concerning adversity** (perseverance): *How do such material practices produce communities and collective forms of decision-making, necessary to cultivate them?*

Dealing with human 'waste' is confrontational because for centuries it was an easy target of narrow purification regimes (Douglas, 1966). But if humankind is to reconnect with the life-enabling cycles of digestion, human 'waste' is the most obvious socionatural linkage. This research is motivated by communal human 'waste' upcycling in urban Europe[8], and is therefore part of a larger movement for recultivating biological humanity.

Fermentation and digestion belong to the adaptive world where everything is connected or significant; and expands human abilities. This ability-centred design attempts to meaningfully enhance human abilities so that designed systems connect on a deeper level to the existential needs of people (Dubberly et al, 2010). This study is stretching abilities by implicating people into a dialogue with the inner and outer dimensions of digestion for bringing out untapped and fuller potential that is present in every body (ibid:79).

[8] **Community-run, performative dry toilets in Brussels:** Titled as 'L'Usine du Trésor Noir' ('The Temple of Holy Shit'), architecture group *Collective Disaster* combined Terra Preta toilet facility with place-making in a derelict downtown park in summer 2014. Commissioned by the Belgian Ministry of Environment, *Collective Disaster* involved neighbours in planning, building and operating the facilities. The temple-like structure was specifically designed to make the processing stages from 'waste'-to-soil into an enjoyable, social experience. The toilet units were integrated on top of a pyramid-like, elevated platform with stair access from three sides. On the back side, the toilets could be exited on two slides while the stairs served as stage for concerts and plays. The inside of the sanitary pyramid structure (beneath the toilets) on ground level housed the sealed collection barrels where the biomass from toilet users was fermented with microbially activated biochar. From this collection chamber the barrels could be easily rolled on narrow-gauge tracks to the adjoining composting site. The excess heat of the compost process was harnessed for operating hot tubs installed above it. Usine du Trésor Noir has garnered several ecological awards and international acclaim (Karga, 2014; Sollazzo et al., 2014): https://www.collectivedisaster.org

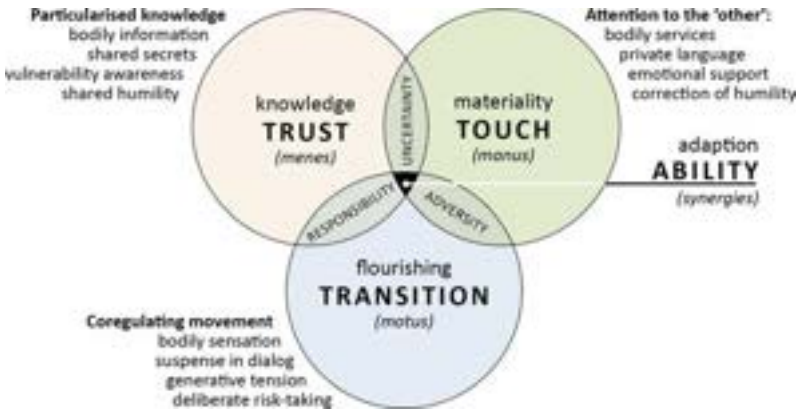
Tree-growing diaper upcycling venture in Berlin: Since 2014 the non-profit DYCLE allows young families to generate edible forests from biodegradable diapers that are processed with the Terra Preta method. One baby alone uses several thousand diapers that can be fermented and composted into soil for growing heirloom fruit trees in periurban areas. The participating families are involved in diaper production with a biochar lining, collection and communal composting and annual tree planting events (Pfisterer, 2016; Reynaert, 2016). Currently about 100 families around Berlin-Pankow are part of the DYCLE community and through open source manuals and events the concept is currently adopted in several cities worldwide. DYCLE has garnered ecological business prizes and international acclaim (Galán, 2017): https://dycle.org/en

1.3.3 · Three core lenses orienting this exploration

The common thread that weaves throughout this study is the theme of adequately adapting to the joint effort of thriving. In reviewing literature across the disciplines of (micro)biology, experiential pedagogy, motivational psychology, and researchful craft, three basic aspects in this ability-oriented 'world of eaters' were consistently recurrent. All organismic systems (and self-enhancing designs) can adapt in self-directed ways to the environment they integrate with. Aside from their specific expressions, such organisations have in common three propensities: they can (1) **perceive** and differentiate two or more conditions of the situation they are embedded in; (2) **engage** cognitively and physically with the surrounding situation based on these perceptions; and, (3) **adapt** based on the psychosomatic engagement, responding to the needs of the system in relation to the changing situation.

With Levina's idea of *inhabiting* selfhood in intimate rapport with the world, the organismic adaptation model is transferable to the human experience. Sociopsychological adaptation then involves: (1) **trust** deriving from "particularised knowledge" (Zelizer, 2005:14) where sensory information, awareness for vulnerability, or shared secrets, provide a mental space of possibilities; (2) **touch** articulating the "attention to the other" (ibid) where bodily activity, shared language, or emotional support manifest into processes and artefacts; (3) **transition** interrelating the *trust* and *touch* dimension. Here particularised knowledge and awareness for otherness lead to coordinated selforganisation. The overlap of these dimensions in the centre of the following Venn diagram (figure 2) is then representing the (4) **ability** of human development and thriving.

(figure 2) **Ability model: three core lenses and *adaptive dimensions* orienting this research**



The three research lenses plus the centre of gravity are applied to each chapter in this thesis to systematically explore the material in regard to ecological, logistical and transformational aspects.

This ability model signifies the core lenses of this research and is the compass of orientation for the entire thesis: each chapter is organised into four sections corresponding to the *adaptive dimensions* (1) perspectives, (2) interactions, (3) interventions, and (4) synergies.

Design educator Nathan Felde (Brambilla, 2018) applies the same lenses for preliminary research engaging with scenarios. For unpacking complex issues, Felde identifies three lenses that translate the ability model from human level to the exploration of situations: (1) **ecology** constitutes the temporal and spatial context of the work as provided by the environment; (2) **logistics** entails, beyond mere infrastructure, all materiality and dynamics created by human activity; (3) **welkinship** interrelates ecology and logistics. Welkinship, a neologism derived from 'welkin' for sky, points to elements shared among all life forms. Only in the full consciousness of shared; life-essential ecologies do these abilities engender synergies for all involved.

These core lenses have been further applied to the research framework to be introduced in chapter two: (1) **theoretical setting** provides the perceptual background of this study; (2) **research motives** formulate the investigative work; (3) **research approaches** enliven theories with socio-material intervention. The listing on the following page (table 1) features the thesis of this four-year long study.

(table 1) **Structure of thesis components**

CRITERION:
Concern for **integrative** flourishing

RESEARCH FRAMEWORK

Theoretical setting *perspectives*	**Research drivers** *logis-tics*	**Research approaches** *synergents*
Integrative adventure (2.1)	Agroecological pedagogies (2.4.1)	
Interexistent autonomy (2.2)	Mobilising abilities (2.4.2)	Upcrafting Ventures (4)
Biological economies (2.3)	Failure tolerance (2.4.3)	In-group ecohealth trial (5)

RESEARCH QUESTIONS

< Factors engendering acceptance and deep commitment when reintegrating human 'waste' >

< Factors engendering <u>thriving under adversity</u> in experimental collaboration >

METHODS

Grounded Mobilisation (3)

Collaborative Provotyping	**Acceptance Probing**	**Integrative Biopedagogies**
Cohabitation interventions	Craft-led platforming attempts	In-group ecohealth trial
		Constant-comparative analysis
		Adventure renderings (6)

FIELD EXPERIMENTS

Upcrafting Ventures (4)

Artful stagings	**Civic proposals**	**Speculative collaborations**	**In-group ecohealth trial**
The Zero Organic 'Waste' Home	Biochar production in the New AgriPark	Biochar from spent grain at HK Beer Co.	*Aquaforming Mars!* (아쿠아포밍 마즈!)
Soil Cooking	Biochar-based Terra Preta technology demonstration	*Black Circle* (雲土間)	MAIN STUDY (5) (In-group practice trial) *ANTHROPONIX* (人類水培) (formerly *'Golden Growing'*)
Fermenting Jeju	*The Compost Alliance* (城市在發酵)	*Full Moon Char Soirée*	
Make friends with Lactos!		*Turning 'Waste' into Gold*: *Generate Indigenous Bokashi*	

OUTCOMES

Press reports	Policy proposal	Design article	Bioscience article
	Funding proposal	Media conference article	Design book chapter
		Pitch proposal	Exhibition catalogue
		Pitch trailer	Video documentary
			(Seed grant)
			(Internalisation grant)

1.3.4 · Chapter-by-chapter overview

This research investigates how attending to the basic needs of bodily existence can mobilise transpersonal abilities and expertise. This deliberate crafting of daily life, strives to reconcile the socio-material exchanges of individual households with the planetary home. Substantially rearranging human-environment relations requires courage, bodily engagement, and failure tolerance. Through its exploratory character, this study draws on a wide range of expertise and practices. This fermentive research is translated into a thesis that may deviate structurally from what is considered conventional. To orient the adventurous reader, here is a shorthand itinerary of the seven chapters in the journey ahead.

Existential Reconciling: C H A P T E R O N E *sets out* to declare 'adventurous homemaking' as the crucial site for social experimentation since it is at the crux of the detrimental human/nature disconnect. Negligence for bodies in existential need of self-regulation with their environment has led to detrimental blockages in biological circulations that reduce the future prospects of life. This research is seeking collaborative interventions that help people to become regenerative contributors in natural and social ecologies, starting from their digestive byproducts. Contemporising ancient agricultural methods, fermentation is putting the human body into biological circulations and collaborative capacity building. Rearranging everyday routines, dealing with messy alliances, and overcoming disgust, likely triggers resistance. Making the leap toward ecological homemaking will depend on the ability to inhabit and learn from the challenges presented. The central question in this study is what collaborative strategies and social buffering can assist people to commit to and prosper in ambiguous situations.

Movement Cultivation: C H A P T E R T W O *conceptualises* across disciplines the *adventurous* practice that guides this research. The adventurous homemaker is not a lone, daredevil actor, but is instead a self-aware partner in relation to challenging otherness. This suspension of entitlement and status is necessary to break into new territory and open potentials beyond the individual. Opportunities for greater choices increase when humans stay in close, body-aware exchanges with their environment, rather than external impositions. This self-regulating adventure makes room for human ephemerality which then

is catalyst for honest insights, solidarity and creative openings. Unrelated to notions of housewifery, adventurous homemaking expresses the desire to be a self-contracted producer of one's own life and sustenance which mobilises every member of the household. In this crafting of daily life, constant expertise and alliance building are a natural extension, drawing the human bodymind into connecting impulses with the world—attentively, physically, and narratively. Since all human-environment interactions are wrapped up by unseen (gut) bacteria that impact thriving, human 'waste' is a collaborative byproduct from bargaining alliances of inner and outer ecologies. Fermentation as coevolutionary cultivation of digestion inevitably entails risky alliances, like all living and political processes. Since fermentive collaborations involve trust, yet are tolerant of mistakes, they afford dynamic learning and subjectivity.

Grounded Mobilisation: C H A P T E R T H R E E *protocols* the methods that underpin the field experiments and multiform analysis of the participatory study. This research started with a specific topic – the reintegration of human 'waste' in urbanity – and embraced people's concerns that this topic raises, for then shaping interventions with what mattered most to participants and context. The field experiments provided the adaptive orientation, necessary to formulate a worthwhile proposition with human 'waste'. This cumulated into the *biopedagogical* approach of the study, where participants implicated themselves into horticultural urine upcycling for moderating shared wellbeing—in turn provoking adequate action. Research with such focus on process; has notoriety for lacking proper knowledge manifestation. In response, data was comprehensively collected over the six-week study and inductively analysed over three iterative phases. Applying the constant-comparative approach of grounded theory, the emerging categories from participants' existential concerns were reconciled with concepts from pedagogy and psychology. The results were rendered into workable, visual models for tracking communal collaboration dynamics.

Upcrafting Ventures: C H A P T E R F O U R *chronicles* the 13 collaborative field experiments that instigated inventive ways for sensibly upcycling human and organic 'waste' in Hong Kong between 2015-17. 'Upcrafting' is a neologism for engaging with biological and human ecologies in less controlling, more convivial ways. 'Ventures' denotes the desire to learn and thereby granting the licence to fail. These communal fermentation events evolved around a group of young, broadminded people. They engaged audiences at educational

farms, galleries, science labs, and businesses to seek practical applications, validate bio-remedial techniques and build up support—in an effort to help configure the study. The field experiments explored *who* is willing to help contemporise knowledge, *how* the everyday can be framed as an activity domain, and *what* kind of joint purpose can drive the explorative working alliances. Adapting to the intrinsic limitations, the emergent learning informed the study. The resulting communal domesticity intervention would engage 22 households in Hong Kong for almost two months in an ecohealth mobilisation.

Hortophillic Ménagerie: C H A P T E R F I V E *evaluates* from first-person accounts the coordinated domesticity intervention whereby 22 participants fermented their urine for growing edible plants in an indoor horticultural system. *Hortophillic Ménagerie* characterises the unusual collection of fermenting bacteria, cherished plantlings, hungry humans and *domesticated* urine into an ad hoc working alliance. This social support was vital when the technically flawed design made it futile to grow anyting. At this crisis point, participants reached out and focused attention on action. The mentality shifted from trouble shooting in separation, to acute collaboration. In the tension of jointly encountered ambiguity (not knowing the problem's origin) the integrative goal (linking human to plant health), created a failure-friendly situation conducive to shared concerns, inventiveness, and rich the emergence of meaning. Through participant-led documentation, and field observation, this chapter identifies the external pedagogic factors that made participants act relationally in the face of ambiguity. For understanding how failure transcended into a joint learning experience, a deeper-probing analysis was required in relation to existential needs which stimulated participants to adopt mutually beneficial goals.

Adventure Renderings: C H A PT E R S I X *visualises* how participants felt in bodily-substantiated ways about their failing plants, limiting devices, close strangers and finicky bacteria. This complements the participants' immaterial self-declarations in the previous chapter. Exploring adventurously is about probing the boundaries of personal conduct inside a challenging, yet supportive setting. Analytical renderings were established to understand the emotional fluctuations in this self-regulation. The sequential markings give testimony to participants' psychodynamic processes in collaborative situations. Informed by transpersonal motivation research, criteria for mental authority and societal internalisation were correlated with quality of adaptation for visualising the participants experiential journeys.

The renderings indicate that participants who stayed active in socio-material dialogue, adapted more adeptly to adversity than others who relied on immaterial aspects like identification, shared values, or status confirmation. Notably, factors like *care* or *closeness* were less conducive, while direct access to competence and support were crucial to enduring commitment. The rendered analysis showed how the work alliance provided ample involvement choices, permitting participants to utilise the group multidimensionally depending on personal need. The analysis confirmed the importance of the integrative goal for self-contracting and discovery vis-à-vis turbulence that opened the horizon for reinterpretation over time.

Integrative Flourishing: C H A P T E R S E V E N *concludes* with a vision for design as a practice for durable, interexistent flourishing. The study demonstrated how the flourishing potential of human 'waste' becomes desirable when it is sensibly employed for regenerative or biopedagogic purposes. Engaging with biophysical materiality necessitates generous allocations of time and space, which is at odds with efficiency thinking. The adventurous practitioner is challenged to establish an overarching connectedness through bodily awareness, material attention and authentic language – trust – that allows participants to stay in reflective and harm-aware motion together. Engaging with the creative tension of matter and form, vision and reality, growth and decay, is essential for integrative flourishing. Design as flourishing practice adapts to the situation (rather than dominating it); and bears the consequences (rather than disregarding the full costs). In sum, homemaking as an accountable adventure entails bargaining partnerships forged through self-contracting purpose, solid rapport with all involved, uncertainty as a mobilising concern, and the admission of human frailty as a wellspring for adept advancements.

The thesis is complemented with two dozen footnotes which put the arguments and findings of the study in direct relation to relevant discourses in agroecological research, eco art history, healing practice, and craftivist research.

1.4 · Scholarly byproducts

The focus of this study was on establishing field experiments to advance research in existentially aware, social transformation. Hence, the emphasis was put on acquiring and validating knowledge instead of its dissemination. With the academic output modest in this work-centred research, the publications produced are considered scholarly 'byproducts'. Mirroring its interdisciplinary character, the study has produced four short academic articles published in the proceedings of a media art conference, an environmental science journal, a design research journal, and a forthcoming design philosophy book. All four articles are reproduced in the appendix and briefly introduced here.

1.4.1 · Publication 1: Media art

Authored for an electronic media conference, the article *Cultivating More-than-Human Lifeworlds: Laudatio on Indigenous Fermentation, Smell and Metabolic Power Grids* (Wernli, 2016), reviewed the aesthetic implications of fermentation processes in current electronic art. Exploring the intersection of electrons and enzymes from the point of view of bacterial cultures, ethical questions are raised rather than answered. Based on microbiome research, more conscious ways of relating to and learning from bacterial alliances are proposed. When human aesthetic articulations like sound or visual art rely on bacteria power, it destabilises the borders of species and can appear as an assemblage of animality. Humans are limited (and always will be) in knowing and sensing the lifeworld of microbiota despite their increasing dependency on bacteria for micro-metabolic power grids for example. The article suggests looking beyond mere utility and aesthetics for considering and creatively adopting the successful continuum of bacterial working relationships into human organisations. Human governance has a lot to learn from the coevolutionary forces of social coalescence, cultural manipulation and adversarial companionship.

1.4.2 · Publication 2: Environmental science

Supporting the applied microbiology research of Nadejda Andreev and her cohort at UNESCO-IHE Institute for Water Education in Delft, the paper *Lactic Acid Fermentation of Human Urine to Improve its Fertilising Value and Reduce Odour Emissions* (Andreev et al., 2017), was co-authored. Lactic acid fermentation of urine – employed in the study of this

research – affords stabilisation and odour reduction by preventing ammonia volatilisation. Fermentation improves collection handling of source-separated urine and its nutrients retention. In this technique, lactic acid bacteria are sourced from sauerkraut brine (fermented cabbage juice), then propagated with sugar input *prior* to urine collection which leads to acidification (pH reduction) in anaerobic storage. Compared to urine stored with airflow, undesirable ammonia content in fermented urine is reduced by at least one third and the lactic acid bacteria strains remain viable in high concentrations (7.3 CFU/ml) after one month of curing. In joint olfactory testing trials at the researcher's Zero Organic 'Waste' Home in Hong Kong, and Nadejda Andreev's farm lab in Moldovia, an odour acceptability index was developed to conduct a survey. It pointed to the significant reduction of perceived odour strength in the fermented urine, increasing its acceptance. The evaluation of fertiliser value with seed germination tests showed how fermented urine impacted plant growth beneficially compared to untreated urine. Aside from sealed canisters, lacto-fermentation was also applied to large urine tanks with open airflow, where it reduced, to a lesser degree, the emissions of odour and ammonia. Urine fermentation has a potential in larger scale applications such as irrigated farming because stabilised urine minimises phosphorus precipitation, which commonly blocks drip irrigation systems.

1.4.3 · Publication 3: Design research

Cubic Journal accepted *Adventurous Upcrafting Ventures* (Wernli, 2018) for its 'Abstract' section, an early-career research feature, offering a preview into the 'work' chapter four, of this thesis. The piece illustrates on a double spread the activities of the fermentive change experiments conducted in 2015/6. In the performativity of unpacking the processing of human 'waste' on the urban rooftop, social and collaborative opportunities were explored. In numerous engagement probes with local industry, government, and leisure education, the Upcrafting Ventures eventually informed the biopedagogic orientation of the study—*pedagogical* here is understood as an arena of socio-material doing, exchanging and learning. As much as the Upcrafting Ventures failed when measured by common success standards, they have generated a diverse and steady following of biophilic people keen to explore alternative ways of making home, knowledge, and community.

1.4.4 · Publication 4: Design philosophy

Answering a call from editors Kate Fletcher, Mathilda Tham, and Louise St. Pierre, the essay 'Shortcomings and Vulnerabilities' was accepted for the forthcoming book *Design and Nature* (Routledge, spring 2019). The book aims at scrutinising design as the powerful extension of humankind which is in profound need of more eco-existential insight. Structured as a dialogue between nature and design, the book presents ideas, perspectives, and practices for re-relating and uncovering how design can engage with the natural world in more sensible and courageous ways. With the explicit mandate to write in *first-person* narrative, the essay is a frank account of the researcher's struggle in the course of working in mutually receptive ways with biological conditions and humanly inflicted restrictions. Focusing on planning and implementation of the study, the value creation behind the technically failing socionatural intervention is critically evaluated. The study bought humans and plants into a consequential, miniature food loop. Combining urine fermentation with water-based indoor horticulture, 22 plant-loving participants in Hong Kong collected and stabilised their urine—expecting to grow *personalised* kitchen herbs and salads. In this trial of 'participatory urban metabolism', collaborators were enthused by the prospect of linking personal eating behaviour with the wellbeing of their vegetal offspring. Yet, designerly impudence on the part of facilitators made all involved susceptible to floundering plants, inconvenient confessions, and improvising. In the end, the human alliance that formed out of this shared frailty helped withstand turbulence, made for companionship and eventually led to modest breakthroughs. Ability-stretching design here could be understood as contemporising traditions for reconnecting people with their biophysical foundation and exploring attempts of more adventurous homemaking.

●

The publications are manifestations of the continued dialogue and collaborations from which this study emerged. The media art paper and design research article helped to position this research, while the environmental science paper was crucial to lending technical credibility in conducting the participatory study. The forthcoming book chapter is confessional reflection on the challenging relations between failure acceptance and rational dispositions in design. It is a tension that unfolds throughout this work.

This research explores social, craft-informed ways of existential formation and ecological nurture. It mobilises commitment, techniques, and people, in an effort to heighten sensibilities for their impact on behavioural responses, group dynamics, and the natural world. The next chapter bundles the conceptual currents that underpin this researchful adventure.

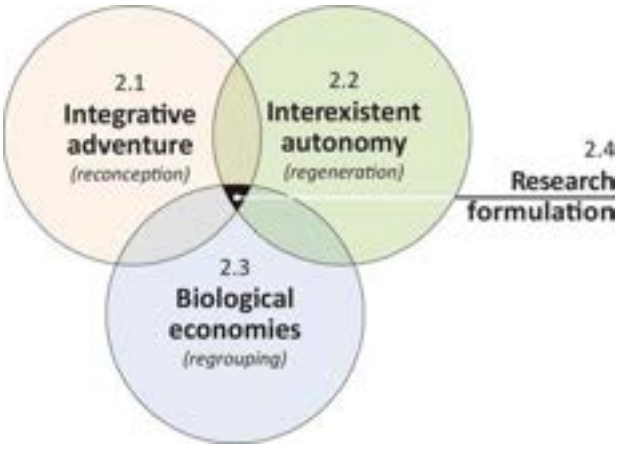
1

Movement Cultivation

When it comes to addressing pain, matter is not real.
Patterns of movement make it so.
—Kimerer LaMothe

This chapter situates the study in thought and discipline to give orientation to the inquiry. The theoretical influences outlined in this chapter entail a two-legged voyage. The first leg in sections 2.1 to 2.3 explore the theories vital to direct the research intention, and help frame the entry points. The theories are thematically organised into three parts, including **integrative adventure** in 2.1, **interexistent autonomy** in 2.2, and **biological economies** in 2.3 as the following Venn diagram (figure 3) illustrates. The second leg in section 2.4 distills from these theoretical streams the **research formulation** relevant for approach and methods of this study. Both legs follow the research lenses introduced in the introduction chapter that relate to perspectives, human activities, and synergies.

(figure 3) **Conceptual streams in *adventurous homemaking***



The four sections in this chapter apply the ability model *to the literature review with ecological (2.1), logistical (2.2), and transformational (2.3) dimensions leading up to the study's research formulation (2.4) in the last section.*

Daniel Wahl (2016) and Robert Stevens (2015) describe how all life forms strive to advance their existence beyond survival in a quest for thriving. While survival is likely to be a short-term and individualist pursuit, seeking to thrive implies necessarily duration and relationships. Jean Russel (2013:6) indicates how long-term flourishing stems from the concurrent interrelation of individuality *and* sociality:

> The goal of evolving our behaviour should be to thrive both individually and collectively (Russell, 2013:6).

Behavioural response that allows thriving, manifests not just in individuals and the collective, they are also environmentally conditioned. Thriving rooted in personal and relational competence resonates with what Arturo Escobar (2018b) calls "radical interdependence" of all living beings. He proposes the sensitive coordination of behaviours as part of a vision for worldmaking he calls "design for the pluriverse" (ibid).

Wahl, Stevens and Escobar indicate how responsive behaviour, the enactivation of self, is constantly emerging and advancing. It is the outcome from being in moving relation with otherness. In this study, the self that is partaking in worldmaking is not restricted to the mind or cognitive abilities. The self here is understood as an ecologically integrated bodymind organism where the psyche (the person) is inseparable from the lived body (the organism). In what Maurice Merleau-Ponty (1962) describes as *organismic phenomenology*, humans, like any other animal, do not have a body, they *are* a body. The intentions of this lived and living body are dynamically embedded in the organism's functioning and vice versa. This indicates how behavioural evolution by necessity involves the biological body with social learning—a view that is contested in some behaviour change theories (Grizzell, 2007).

From the vantage of radical interdependence and organismic phenomenology, this biologically informed research is building on the two basic ontologies of *development* and *flattening*. The ontology of *development* proposes that the self is only fully constituted though its embodied coordination. The ontology of *flattening* suggests that the desire of thriving is putting every body ethically on a plain level field.

The ontology of development: Transformations in person, society and biological systems stem from continuous interactions of the organism with its factual context. Lasting change in people usually does not occur by imposition. It does so in exchange with and in acknowledgement of its relation with the environment. In Gestalt theory, this process of relational reconciliation is referred to as *contact awareness* and can open up the opportunity for greater choice (Sonne & Tønnesvang, 2015). Working with people toward adequate functioning in their context, revolves around the coordination of sensory regulation and meaning-making processes. This relates back to perceptive capacities described by James Gibson (1986:127-9) as *affordances*: what the environment has on offer to the organism is deriving in the continuous organisation of reality-testing and reality-matching. Thus, meaning is constituted in the fluid subject/object movements to ensure the creative adaptation of organism to environment in the most suitable ways.

Heidi Overhill (2012) indicates how affordances depend not only on modifications in the features that are accessible in the situation, they also derive from changing the extending abilities of the person who is animating these features. Affordances therefore rely on the capacity for engaging in moving relations with situational features that is described by Kimmerer LaMothe (2015) as *ecokinetics*. In her concept deriving from dance research, any ordinary action can be a conscious, movement-based participation in the world. Movement that heightens human consciousness is pulling resistances like obstacles or pain into the bodily reality. Thriving here is understood as seeking adequate response patterns instantiated by external demands. In direct encounter with obstacles – rather than their elimination – the bodymind is teaching itself to move differently.

LaMothe describes how through the awareness and response patterns over time and space, bodily movement allows for richer possibilities and social connections. Because such movement patterns create an *ecokinetic knowledge* that cannot secured any other way, she refers to them as a critical cultural resource (ibid). Staying in constitutive movement with the environment is also indicated by Amartya Sen (1985). She points out how the expanding potential of *being and becoming* are relevant for a thriving life. The so-called “functionings” (ibid:6-10) between external demands from the community, like establishing a role, and internal capabilities, like building skills, are generative forces for advancement and thriving.

The ontology of flattening: In the moving relations between people and the environment, food plays a major role. Richard Le Heron and Michael Carolan (2016) propose to engage in more experimental ways with food and agriculture by animating human-environment interactions in terms of *biological economies* (details in 2.3). Approached from intrinsic biological interdependencies, common categories like food producers and food consumers can be replaced with the notion of living in the "world of eaters" (DuPuis, 2015), thereby decentring what is assumed to be the human world.

In a *world of eaters*, humans are wrapped up with unseen biota like gut bacteria that affect thriving from outside and from within. In an ever-eating world that is instable and where individuals alone cannot exist, Ursula Le Guin (2014) calls for the experimental co-production of thought and practice that is simultaneously attentive, affective, ethical and political. Unless humans can permit and relate to this critical and unifying instability – including volatile food systems, rapidly changing climates, or fragile mental constitutions – thriving is increasingly restricted (Sonne & Tønnesvang, 2015). It means to look beyond mere human behaviours and consider how the biological world is impacted by human activity and vice versa.

As integrated part of the biological economy, humans are inheriting not just genes, behaviour responses and tools, but also modifications to the environment like carbon dioxide, sedentary lifestyles or microplastics. In the sense of Jean-Baptiste Lamarck (Gissis, 2017), design is an agent of self-evolution since it modifies both the environment and the human inside of it (Overhill, 2018; Fry, 2009). Because such inherent evolutionary flattening is touching on everything from biological life to cognitive tools, it opens a field of inquiry for design that is far broader than behaviour.

Ontologically flattened means to be entangled in complexity without succumbing to it and getting stuck. Cultivating movement in this ontology lies in the experience of reality with behavioural reactions to it, where dynamics of feedback and simultaneity are chiefly considered. This study enters this moving mutuality with a tolerance for uncertain outcome and sincere intention of learnful engagement in life-supporting, adventurous ways.

2.1 · Integrative adventure

Adventure in this study is not seeking out extreme performances in blind faith or brazen disregard. It is invitation to a journey of conscious participation with the world that sharpens focus, guides action and can make daily experience more invigorating in every life domain, as Matt Walker (2011) indicates:

> At the core, adventure is to commit to an uncertain outcome with an open heart and a willingness to learn and engage. It is the ability to take a leap into the unknown with mindfulness and grace. Framed this way, opportunity for adventure presents itself to us everyday (Walker, 2011).

The uncertainty in adventure can open opportunities for stepping outside of oneself where the larger situation provides fresh and unexpected insight. It can infuse energy, intensity and vitality into routines and relationships. In the tension of a demanding and ambiguous situation, the mindful adventurer is entering into, what Albert Borgmann (1995) describes as "commanding presences" with the environment:

> The commanding presence is something that has a telling and strong continuity with its world and is an embodiment and disclosure of the world it has emerged from (Borgmann, 1995:39-40).

The unknown, the riddle, the unexplainable of a phenomenon that is larger than the self can be revelatory. Commanding presences stem from a suspension rooted in the context that brings about resonance and insight. Adventurous living is then both about the courage to engage with and find significance in the given situation.

While it is not necessarily adventurous, experience design also aims to bring significance to experiences in concrete situations (Shedroff, 2006). Informed by experiential psychology, it employs inquiry, evaluation and techniques to understand and mediate human needs and intentions in relation to given conditions. Experience design focuses on delivering predictability and human-centred solutions for the market, thereby the potential for adventure, commanding presences and evolutionary foresight may be limited.

In the tenuous relation of uncertainty and commitment, prevalent in adventure, the ability of foresight is required. Bill Sharpe (2013) indicates how foresight is a human capacity that

can be practised. In contrast to prediction, which can fixate positions, foresight is an ongoing scanning and anticipation of probabilities that acknowledges the uncontrollable dynamics in a biological world, where humans are inescapably participating in. When acting with foresight, the actor is integrating with and connecting to complexity. This connecting of selfhood with otherness draws simultaneously on all capacities of knowledge-making in the bodymind. In this dynamic of sensing, feeling and intuition, rational thinking is just one aspect of doing and knowing (Harding, 2013).

2.1.1 · Rehumanising collaboration

Daniel Wahl (2016) proposes to nurture the capacity for foresight and conscious participation in the biological world that is firmly oriented on natural change processes, ecological literacy and living systems' thinking. Resilience theory indicates that the biological world is *not* a standing reserve in a self-stabilising equilibrium. It emphasises, surprise, shock, and cessation as the defining or redefining moments to life processes. Such susceptibility to unpredictability and discontinuity is not just present in the biological world but integral to the human condition as well. It could be argued that these adaptive sensibilities to biological systems would begin with enhancing such susceptibilities in the way people live, work and learn together.

In her vulnerability research, Brené Brown (2012) indicates how the reconciliation with the unpredictability of living is essential to wellbeing and conscious interaction with others. In a world oriented on perfection, invincibility and apprehension, the capacity of vulnerability is easily dismissed. Contrary to popular understanding, vulnerability is not about being wounded or hurt as Jay Tropianskaia (2017) indicates:

> […] vulnerability is not about allowing ourselves to be hurt by another, but rather […] it means being honest about our human frailties […] and let the other's responses get beneath our skin, even if it hurts, without defensiveness (Tropianskaia, 2017).

Brown documents how this defensiveness – the obsession of shielding the frailty of self – is diminishing the human potential. As long as there is no emotional porosity and acceptance for shortcomings, humans cannot be their authentic selves, cannot fully thrive, cannot closely connect with each other. In contrast to vulnerabilities in non-living, command-and-control structures, vulnerability in living human situations is not a weakness, indisposition or

a matter of choice. David Whyte (2015) indicates how consciously engaging with the ephemerality of a mortal existence, is the natural condition of humanness and the foundation of building creative potential and inter-human solidarity:

> The only choice we have as we mature is how we inhabit our vulnerability, how we become larger and more courageous and more compassionate through our intimacy with disappearance, our choice is to inhabit vulnerability as generous citizens of loss, robustly and fully (Whyte, 2015).

Unpredictable, experimental situations run counter a culture where mistakes ought to be avoided, guarantees are treasured, and imperfection – human vulnerability – can be disguised as shame and withdrawal (Brown, 2012:182). The experience of uncertainty can either lead to, or lead away from insightful awareness and close connection as indicates depending on the degree of support in relationships. Herbert Stevenson (2005) indicates how with supported, internal authority – simultaneous appreciation of self and other – the experience of uncertainty can open discovery, genuine responses, and engagement with discomfort. In this support dynamic, vulnerability becomes a generative force, since the potential of the present moment is resourced, rather than a diversion from past experience that is likely less attuned to the demands of the given situation (Sonne et Tønnesvang, 2015).

In situations where due to lack of self-support, the ability for addressing critical issues is eliminated, personal defence routines (diversions) come into play to prevent embarrassment, thereby restricting original contributions (Argyris, 1990). By checking into oneself and others on regular basis, a presence-vulnerability dynamic can invite collaborators into a space of experimentation for trying out fresh responses and gaining new insights.

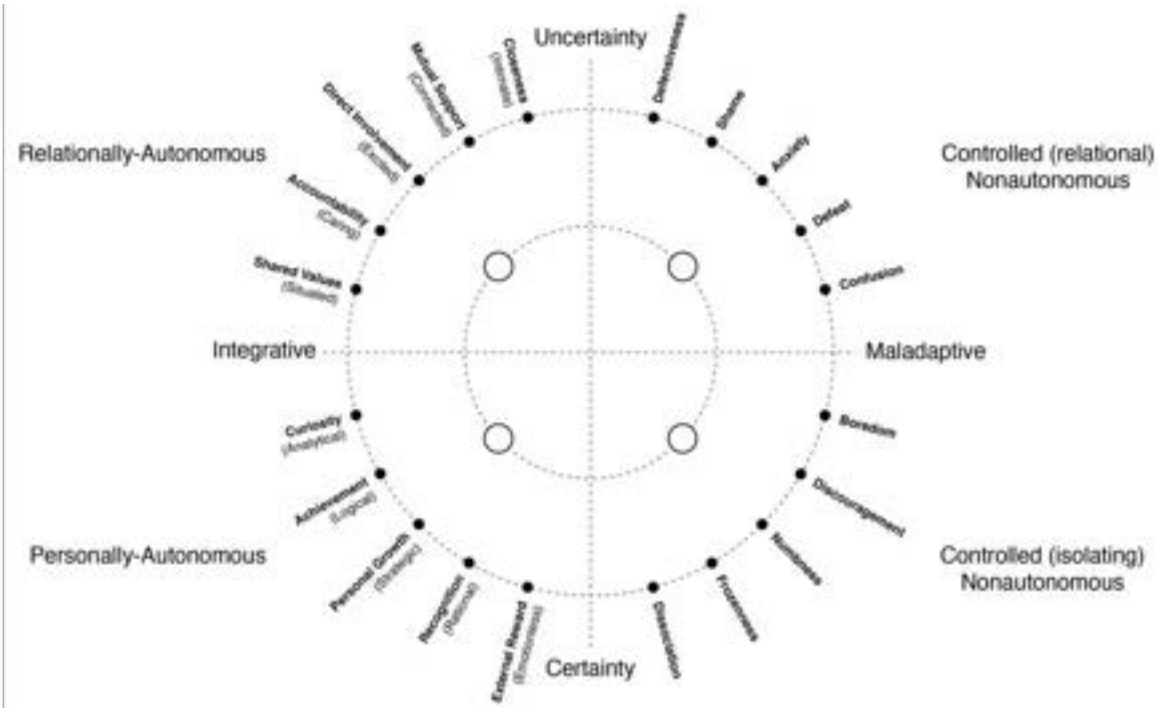
2.1.2 · Mapping existential passages

Herbest Stevenson (2016, 2005) has established a mapping approach to interrelate external uncertainty with the degree of elicited self-support, for gauging the connective possibilities in participants. This *contact model* was developed for understanding the emotional dynamic of person and close others and assists self-observation for psychosomatic manifestations during exchanges in coaching settings. By distinguishing between the psychodynamic influences that are external to persons and internal to them, an understanding for their

existential presence and journeys can be developed. Through recurrent assessing into themselves, in direct relation to others, it is possible to gain more clarity for the psychosomatic responses involved in persons, relationships and situations. Since existential needs are often obscure to the individual, the *contact model* is a way to guide the conversation on existential efforts and affect at regular intervals.

Originally conceived as a quadrant map, it has been rearranged for this study into a chord diagram (figure 4), to make room for displaying the sequential fluctuations of existential passages along the juncture of external uncertainty (vulnerability) and internal, mental adaption (internalisation).

(figure 4) ***Integrative autonomy*** **chord:**
Rendering of existential passages on the vulnerability-internalisation juncture
(Modified from Stevenson's *contact model*, 2005; 2016)



Chord diagram for rendering existential manifestations and their fluctuations over time. The four dots in each sector represent (from top-left to bottom-right): connected*,* self-loss*,* analytical *and* numbness*. The comparison with Stevenson's original quadrant map is shown in appendix.*

The vulnerability-internalisation juncture: The chord diagram above is oriented on the intersecting vectors of *uncertainty-certainty* and *integrative-maladaptive*. The uncertainty-certainty vector refers to the persons assimilation, the experiential response to the given condition (reconciliation of vulnerability). The integrative-maladaptive vector refers to the

regulation of one's internal authority, the sense of self and otherness (mental autonomy from self-support). Borrowed from the original quadrant map (shown in appendix), the chord diagram features four autonomy sectors that indicate the four qualities of mental self-support, which are detailed in chapter six (6.2.2): *relationally*-autonomous, *personally*-autonomous, and their *controlled*-nonautonomous counterparts. The small circles in the centre of each autonomy sectors represent the regulation quality which are: *connected*, *self-loss*, *analytical* and *numbness*:

- **Connected** in the relationally-autonomous sector (upper left) implies a balanced sense of selfhood that integrates the presence and interests of others. This connectedness stems from the combination of strong internal authority together with strong external consciousness. The person is well supported for encountering vulnerability in a position of intimacy, thereby flourishing better in uncertainty.
- **Self-loss** in the controlled (relational) nonautonomous sector (upper right), entails a profound degree of vulnerability is encountered with little support and a low sense of selfhood. Here strong external authority together with internal unconscious reactivity produce a feeling of unprotectedness, especially in uncertain situation (exposure).
- **Analytical** in the personally-autonomous sector (lower left) suggests a reduced or no sense of vulnerability, strong internal authority and self-determination which can lead to a decidedly rational experience of headstrong selfhood and remote awareness for otherness (rationality).
- **Numbness** in the controlled (personal) nonautonomous sector (lower right) indicates that there is neither a sense of vulnerability, nor a perceived sense of self. This likely leads to a situation of non-feeling and disassociation (numbness).

Essentially, people who stay in close relation with others while attending to their own needs, are more relationally-autonomous, thus, vulnerability can be a source for developing relationships and personal growth (Brown, 2012). Vulnerability encountered both with internal strength and consciousness for others established over time, can be a resource of shared strength in moments of high unpredictability upon which to build on (Best & Kincel, 2012).

Engaged and habitual learning: The vulnerability-authority juncture is not just about mental flourishing, but about understanding different propensities of learning. Existential manifestations on the left-hand semicircle with higher degrees of mental autonomy and internalisation, are conducive to *extended learning* and able to proactively incorporate unfamiliarity. In the relationally-autonomous sector (upper left), encountering at the same time the unfamiliar and close others, can open novel possibilities for authentic connections and creative leaps in the flexing tension of ambiguity. In the personally-autonomous sector (lower left), learning is more reflective and abstract. The right-hand side, with weaker autonomy and less adaptability, is more conducive to *routine learning* which is based on reactive, habitual, or projected responses.

In summary, inhabiting vulnerability means to build trust in oneself and in others for becoming more penetrable to external responses or demands rather than defensive. This defensiveness stems from a fear of being honest about personal shortcomings, inabilities and embarrassments which is isolating from others and the present situation. Engaging with human frailties – granted there is self-awareness and support – generates relief and belonging. Bringing focus to the situation and courage in unpredictability is congruent with the systems theory approach to risk-taking[9]. Uncertainty encountered with poor connections to self and others is perceived as a threat, uncertainty encountered with strong relations to self and others produces generative potential.

2.1.3 · Adventures in quest for insight

Mental defensiveness – the shielding from vulnerabilites – is a protection mechanism from the responses and reality of others (Tropianskaia, 2017). In contrast, the admission of one's honest and inadequate self can be the opener for others to do the same. Coming together in such exposed humanness takes courage but it is the basis for integrating and differentiating

[9] **Complexity and risk perspective:** In the risk approach to systems theory the concerns of the different parties involved are reconciled over time (Japp, 2000:91-92). It is the self-commitment into a shared interest that can allow parties to accept a suboptimal results for the advancement of the overall situation. In this evolutionary type of risk no finalised consensus or single-right decisions (substantial rationality) is produced. Instead the outcomes of complex realities are observed and learnt from to prompt suitable interventions. The opportunities for taking action therefore stem from the uncertainty of what is anticipated. Such probationary engagement with complexity produces no definite solutions instead new uncertainties. Central in this approach trust is the central issue since it requires "risky advance concessions" (ibid) for this learning to take place and not just belief, hope or prevention. Literature on risk and uncertainty also notes how such durational trial-and-error learning is not tolerated in fields that lack transparency like nuclear power or pandemics (Perrow, 1999).

ultra-complex situations as indicated by Mikael Sonne and Jan Tønnesvang (2015). Without the obstruction of habitual shields, people can let go of fixations in complexity. In obtaining self-support, they become more relatable, personal relevant insights can be gained, which then lead to unprecedented, creative responses. Salomo Friedländer (1918) described this creative tension from personal vulnerability in self-reflection as the concept of *creative indifference* (schöpferische Indifferenz). Matched with adequate support, ambiguity leads to transformation, therefore there is a need to make it humanly relatable withing the shared reflection. This is particularly relevant since people, like never before, have access to staggering quantities of data, knowledge and points of views (Sonne & Tønnesvang, 2015).

This study relates to humanist traditions of Adventure education and Gestalt practice. Both are experimental approaches to working with people that aim at bringing personally significant themes into the direct, lived experience (Gilsdorf, 1998). In these joint, explorative endeavours, “the spirit of an activity often seems to move beyond the capabilities of the people involved” (Bacon, 1983:54). Adventure education applies measured levels of adversity and exposure in its activities can lead to a dynamic of personal self-remove which is necessary for a fuller participation in the societal context (Dent, 2006:856).

Instead of correcting ‘problematic behaviour’ (behaviourism), or scrutinising the past, Adventure and Gestalt education are interested in the fuller realisation of the currently available possibilities in people and groups. Adventure is not just limited to the outdoors or the dramatic. It is understood as the uncovering of the unspectacular, where conscious engagement with the unfamiliarised may invite unexpected challenges (Fürst, 1996). These humanist learning traditions facilitate situations of connectedness with achievements, intense emotions and sometimes breakthroughs. The theoretical underpinnings in humanistic education have eight common dimensions, which are listed below (table 2) and guiding this study: (1) relational selforganisation in complexity; (2) development through disequilibrium; (3) reflective boundary negotiation; (4) commitment to present potentials; (5) interplay of spontaneity and restructuring; (6) alliance in prolific tension; (7) resilience from insightful failing; and (8) intuition-led knowledge creation.

(table 2) **Common dimensions in experiential-humanist approach of Adventure education and Gestalt practice**

Principles	*Key Concepts*	*Description*	*Source*
Relational Selforganisation in complexity	Holistic approach Field theory Constructivism Unfinished situation Challenge by choice Full value contract	**Self-actualising:** Complexity is embraced by assisting person and group to uncover and realise their own values for re-constructing reality, concurrent with transparent and social relations.	Zinker (1977) Portele (1992) Fürst (1992) Schoel (1988) Fuhr, Gremmler-Fuhr (1995) Perls (1951) Sonne, Tønnesvang (2016)
Development through disequilibrium	The creative experiment Experience 'on the edge' Edgeworking Confrontation Intervention practice	**Leap-taking:** Personal boundaries are explored by overcoming measured levels of adversity that enable the person or group to make contact simultaneously with the environment and internal sensations.	Dewey (1938:79) Perls (1954:284) Fürst (1992) Kimball, Bacon (1993) Rahm (1979) Fuhr, Gremmler-Fuhr (1995) Nadler, Luckner (1992) Zinker (1977)
Reflective boundary negotiation	Figure/ground Multistable configuration Creative indifference Contact Forming Gestalts Awareness practice Internal control	**Attribution:** Mindfulness is fostered through the unblocking of perspective-shifting between selfhood and otherness as method of self-evaluation and internalising goals.	Sonne, Tønnesvang (2016) Perls Laura (1989:98) Nadler, Luckner (1992) Fürst (1991) Schuppli (2016) Friedländer (1918)
Commitment to present potential	Present-centred In the Here and Now Paradox of change	**Present-investment:** The present situation is regarded as the ultimate resource for creative potential, thereby access to change can be provided when person or group reconcile the given conditions with the significance of possible responses.	Perls, Hefferline, Goodman (1951) Beisser (1971) Stevenson (2005) Schoel (1988) Sonne, Tønnesvang (2016) Dewey (1938)
Interplay of spontaneity and restructuring	Adventure wave Contact cycle Challenge and support Resistance Movement cultivation	**Pacing:** To remain sensitive to the experience and for balancing frustration with support, the collaboration provides an oscillation from activity to debriefing, challenge to support, confrontation to withdrawal.	Schoel (1988) Nadler, Luckner (1992) Rahm (1979) Fuhr, Gremmler-Fuhr (1995) Perls (1989) Rohnke, Butler (1995) Sonne, Tønnesvang (2016) Fürst (1992) Zinker (1977)
Alliances through generative tension	The working alliance Support & frustration Backed-up assault Companionship Theme-Centred Interaction (TCI)	**Companionship:** In the tension of supporting, genuine relationships and a common task that necessarily entails frustration or impasses, distractions are supplanted for opening up social potential and personal capabilities.	Cohn (1992) Brownell (2009) Perls (1989) Zinker (1977) Greenberg et al (1993) Lentz (1976) Portele (1992)
Elasticity from insightful failing	Unpredictable outcomes Welcoming mistakes Spontaneous learning	**Bounce-back:** Failure is viewed as gateway to possibility since the most valuable learning stems from unpredicted outcomes, hence flexibility for responding to what is unfolding is crucial.	Sonne, Tønnesvang (2016) Proudman (1995) Gilsdorf (1998) Halberstam (2011) Walker (2011)
Intuition-led knowledge creation	Intuitive reflection Practice as art form	**Intuitiveness:** The focus on the unfolding situation that requires creative moment-to-moment responses, intuitive ways of anticipating and knowing are integral part of facilitating experiental learning.	Handley (1997) Sonne, Tønnesvang (2016) Perls Laura (1989) Zinker (1977) Fuhr, Gremmler-Fuhr (1995)

Synthesis from literature on Adventure education and Gestalt practice that are both anchored in the experiential tradition. In essence, personally relevant themes are pulled into the immediate life context through measured interventions to uncover the intersubjective dynamics.

Relational selforganisation in complexity (self-actualising): In Kurt Hahn's conception of experiential learning (Fuhr & Gremmler-Fuhr, 1995:28), the integration of sensing, feeling and learning in one, all-encompassing process is both central and open for negotiation. This respects the fact that individuals access reality in different ways where a multitude of influences contribute to partial truths. This relates to the concept of constructivism that claims how perceptions are subjective, world constructions socially co-determined, and the

idea of objective reality is speculative (DeLay, 1996:33; Portele, 1992). This holistic commitment to learning is neither being imposed nor possessed. It is a self-directed approach, where group activities foster a thinking-by-sensing, and knowing-by-doing that endorses the discovery of values in relation to the situation (Zinker, 1977). Therefore, Gestalt and Adventure education are led by experience, oriented on values, and evolve around autonomy (Kimball & Barcia, 1993:12).

In selforganisation theory, autonomy is understood as the ability of any living system, including humans, to essentially determine from within how to respond to external phenomena (Fuhr & Gremmler-Fuhr, 1995:147). While the learning outcome in selforganisation cannot be really predicted, all organisms have an engrained sense, an inner wisdom, for what situationally is most important, thus engage in self-regulating action (Perls, et al, 1951:324). The sense of reality in such autonomy is never absolute because it is always changing in relation to group and environment (Portele, 1992:34).

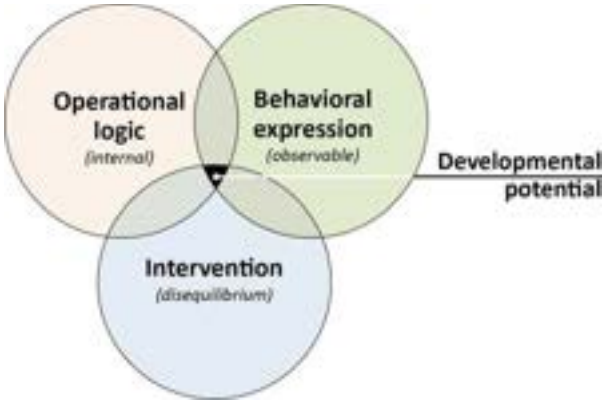
Thriving in this evolutionary regulation, stems from the fluid formation and resolution of accomplishing desires, in adequate and meaningful exchanges with the environment (Sonne & Tønnesvang, 2015). What prevents chaos and builds self-responsibility in this coregulative complexity is the transparency about authority and control: throughout the collaborative situation, the aims, potentials and limits are supposed to be clearly stated and kept open for negotiation (Fürst, 1996:34). In what is referred to as “dynamic of the unfinished situation” (ibid), facilitators are foremost tasked to set up value-adding activities, from which the ensuing action is determined by the group, whereas the final responsibility to participate is in the hands of the individual.

Development through disequilibrium (leap-taking): Adventure and Gestalt education are growth-oriented traditions aimed at stimulating autonomy and self-discovery. Developmental growth means to unleash existing potentials instead of locking them into regimes of expectations, pathologies and correction (Kimball & Barcia, 1993). Growth necessitates challenge. John Dewey (1997) already noted how the confrontation with and mastery of challenges is necessary for personal growth. In the view of Gestalt and Adventure education, living systems are gravitating toward equilibrium: when equilibrium has ceased, the system either grapples for security and stabilisation, or responds—with restructuring

and adaptation (Rahm, 2004). In this homeostatic dynamic, living systems adapt to complexity in the interplay of opposing trajectories of adherence and transition (Fuhr & Gremmler-Fuhr, 1995:118).

The trajectory for adherence, is likely to reclaim the old equilibrium, whereas the transition trajectory can advance to a new equilibrium onto a higher order which is quintessential for development. In this view, learning can be considered as probing boundaries of the "comfort zone", and developmental growth derives from entering into "new territory" (Luckner & Nadler, 1995). When venturing into unfamiliar territory, valuable insights can be gained into one's own rationale of self-functioning (operational logic). In Gestalt education such awareness-heightening situations for uncovering the operational logic in group or person are referred to as "the creative experiment" (Zinker, 1977:125). These explorative interventions in the form of dialogical inquiry, employ playfulness as well as seriousness for prompting creative adjustment in collaborators. Methods like sequencing, fun, humour, imagination, and play are modified to the given context for defamiliarizing the situation. The following Venn diagram (figure 5) illustrates the experiential aspects that facilitate potential for development in person and group.

(figure 5) **Psychodynamic aspects of development potential in Adventure and Gestalt education**



Humanist education suggests how the operational logic of a person or organisation that governs demeanour needs for substantial advancement supported forms of disequilibrium.

Reflective boundary negotiation (attribution): Mere exposure to challenges or experimental situations is not enough for developmental growth to take hold. Restructuring learning only results when individuals or groups make contact simultaneously with environment and their feelings and sensations. This oppositionally experiential grasping (complementary polarity)

in the experience of disequilibrium are described as “edge-experiences” in Adventure education, or as “contact boundary” in Gestalt (Luckner & Nadler, 1995). In absence of consciousness when engaging with the unfamiliar, the opportunity to embrace new territory or turn back is easily ignored and foregone. Contact is understood as the quality of the exchanges taking place between selfness with otherness (Sonne & Tønnesvang, 2015:588) and can be expressed in moments of curiosity, arousal, fear or hostility (Perls, 2005:109). This boundary negotiation is not a fixed state in which one is either inside or outside. It is a dynamic suspension that emerges. This perspective-taking for uncovering psychodynamics that integrate with diversity, may be necessitated at any time, not just after the situation has passed (Fürst, 1996). Insights are gained from registering what is occurring, while it is occurring. Edgeworking is not limited to adventurous experiences and applicable to unsettling situations like struggling, persevering, self-expansion and rearranging relationships.

Noteworthy in this conscious-making along the experiential edges is the Gestaltian conception of **figure/ground**. In essence, it is about the attribution of meaning to the environment, which in turn is shaping human perception. Figure/ground are “multistable configurations” (Schuppli, 2016), where one or more features can be perceived, yet the relation between foreground (figure) and background (ground) is fluctuating, thus each expressed feature relying on each other.

The experience of disequilibrium can be an act of figure/grounding, where the person or group is observed simultaneously as process from *inside out* (‘figure’), as well as structure from *outside in* (‘ground’). This oscillating perspective-shifting allows a continuous comparison from expansion to intensification of experience.

The figure/ground dynamics can also collapse figures, where subjective meaning (what is perceived in the moment) appears against the backdrop with objective reality (what exists over time). Going beyond the perceptive process, adventurous work can enable the person or group to recognise what previously was undifferentiated in the consciousness, and use it creatively for more flexible and situationally adequate responses in the world (Sonne & Tønnesvang, 2015:73).

Commitment to present potentials (present-investment): Development in humans and groups can occur when the entities acknowledge their relation to the environment through concurrently integrating sensations and meaning. To engage with emotions prompted in life, including discomforts, it is essential for staying in touch with what is relevant to sense and act upon (Sonne & Tønnesvang, 2015). The suppression of such contact functions restricts the anchoring of the person or group with its own boundaries, thereby weaken the experience of self in relation to others. The importance of pairing direct experience with the reflection thereof has been already eloquently articulated by John Dewey (1997:69):

> The intellectual anticipation, the idea of consequences, must blend with desire and impulse to acquire moving force: it then gives direction to what otherwise is blind, while desire gives ideas impetus and momentum (Dewey, 1997).

Inside a fast-moving world full of distractions and preconceptions, Adventure and Gestalt education can be considered practices of consolidation that pay close attention to occurrences brought forth by actors and the situation, one moment at a time. The full presence of facilitators, physically and emotionally is imperative to establish a transformative learning process. It is a growth that emerges from within and cannot be imposed from outside. In his “paradoxical theory of change”, Arnold Beisser (1970) famously stated:

> Change simply occurs when you become what you are, not when you try to become what you are not (Beisser, 1970).

For change to emerge from *within* the present potential, facilitators ought to trust that the given situation will supply all that is needed for transitions to be made. In this commitment, directed to present reality, obstacles are considered a vital resource. Accepting pain and resistance, rather than eradicating them, are essential. Avoiding experiences of life aspects that involve suffering is expression of a larger numbness that prevents persons or groups from experiencing other, positive sensations. Therefore, the acceptance of pain and resistance has potential to bring the person or group into confrontation with their life management where the key lies for adapting from within (Sonne & Tønnesvang, 2015).

In this commitment of working with response dynamics that are already present, dialogues with *what*- and *how*-questions are helpful for opening up perspectives and insights (Schoel, et al, 1988:170). In contrast, *why*-questions are pulling attention away from the present into the past or projections and thereby tend to be means of manipulative thinking or prescribed behaviour responses (Perls, 1981).

Interplay of spontaneity and restructuring (pacing): Adventuring and experimenting is a playful engagement with the possible. Accordingly, the experiential methods employed are to be continuously modified according to the need of the situation (Zinker, 1977:147). The critical working principle here is to adjust the degree of difficulty in experimentation to the expertise level of the group (Rohnke, 2012). It is certainly not reasonable to persistently stretch the boundary of experience. People lose their sensibility when nudged for too long at the edge. Pause is as important to expanded learning and gaining insight as action is. Gestalt practice understands life processes as rhythms of contact-making and withdrawing (Zinker, 1977). Likewise, the emergence of insight is a sequencing where aspects from the undifferentiated psychological field (life space) is differentiated into a figure/ground configuration and afterwards recedes back into the undifferentiated life space (Sonne & Tønnesvang, 2015:46).

In what is in Gestalt called “contact cycle” and in Adventure education “adventure wave” (Schoel et al., 1988:27), the stages in this awareness continuum are specified as sensation (stimuli), awareness (meaning from stimuli), action (mobilised energy), contact (goal of act), and withdrawal (satisfaction of goal) (Fürst, 1996; Zinker, 1977). Alternating action with nonaction is also relevant to nurture relationships which require time and room to develop. Adventurous or experimental collaborations thus should be loosely structured. Intervals of challenge, confrontation, tension should be offset with surprising intervals of easy-going activity (Zinker, 1977:129).

Alliance in generative tension (companionship): Adventure and Gestaltian processes can be demanding and adversarial, thereby depend on the extend of support that is available (Perls, 1992:183). Support is meant to be provided unconditionally. It is not granted toward the goal that has been set out, it is provided in genuine interest for the person or group involved (Zinker, 1977:23). In an attitude of generosity, the relationships forged are considered a

"working alliance" (Brownell, 2008): in the adventurous pursuit, unlikely partners convene and co-produce conditions conducive to encouraging dialogue. The relationship is based on acceptance, commitment and genuineness (Greenberg, et al, 1996).

Facilitating a working alliance can seem paradoxical since initiating challenges for people entails also to giving them unequivocal backing. The emphasis on process in this experiential learning does not imply that the quality of content is ignored. In ordinary life, people are conditioned to be result-driven, so mere focus on process, growth and values will lack substance (Lentz, et al, 1976). The actuality of a shared theme or task is lending the group and exchanges a productive focus which is exemplified in Ruth Cohn's (2016) Theme-Centred Interaction, a widely accepted social learning method. The theme is the concrete problem at hand around which people can open up their individual potential, social capacities (Portele, 1992:137) and their situated responsiveness.

Elasticity in insightful failing (bounce-back): Working experientially with people for potentially uncovering complex relations and concerns in the variable field of the 'real world' does not fit into narrowly conceived metrics of achievements. Sonne and Tønnesvang (2015:104) illustrate how methods and analysis should be adaptable and contextual to the non-predictability in interventionist collaborations:

> [This] requires an approach that is both open and domain specific, and which incorporates phenomenological methodology. Furthermore, it requires an action-oriented research approach or other forms of real-world research […], which acknowledge the connection between the observing and the observed (Sonne & Tønnesvang, 2015:104).

When adventurous collaborators can let go of the illusion of controlling the outcomes, they are able to recognise spontaneous learning opportunities (Proudman, 1995). The learning potential in adventurous research then lies in a readiness to commit to uncertain results and enthusiasm for engagement. Facilitators and collaborators are not just adventurous but 'adventurist': engagement here does not stop at vague curiousity but is a readiness for handling immersive encounters prone to astonish, challenge, and fail. Rudiger Gilsdorf (1998:136) indicates how the most valuable insights stem from unplanned activities and situations, thereby requiring a high degree of flexibility to respond to the unfolding reality.

Turning failure into learning can be considered a matter of preparedness for taking a leap into the unfamiliar with attentiveness and agility. For Matt Walker (2011), adventure is the human ability of growing resilience when confronted with obstacles. There is opportunity in failure when expectations are suspended for recognising the absurdity inherent in human existence which can be engaged with alertness, dignity and wit. Judith Halberstam (2011) proposes to get more comfortable with failure by making room for integration, diversity in an effort to constructively oppose the status quo:

> Failure [is] a necessary framework in which to counter hegemony, where a commitment to failing better might create queer modes of being, alternative communities, and new practices of knowledge (Halberstam, 2011).

If failure is really considered as pertinent for substantiating human advancement, responsiveness and potential, then the current rationales of success need to be reoriented. Appreciation for mistakes instead of comparing outcomes, shifts attention to the individual progress as part of an expanding learning potential (Gilsdorf, 1998; Proudman, 1995:21). Importantly, failure should not be seen as the ending but the commencement of the adventure. Granted its place, failure is a reality check to reawaken and sharpen vital intuition.

Intuition-led knowledge creation (intuitiveness): Adventurous education work is not merely about challenges, techniques or methods. Potential outcomes derive from how the experience is orchestrated in relation to the actual context (Handley, 1998). Intuition is an important factor in the facilitation of experiential education. Continuous involvement, observation, mindfulness, reflection, and responsiveness are all important attributes for facilitating learning outcomes.

> The educator's primary role include[s], setting suitable experiences, posing problems, setting boundaries, supporting learners, ensuring physical and emotional safety, and facilitating the learning process (Proudman, 1995:21).

Respecting psychodynamic complexities, the practitioner can apply a wide range of verbal and nonverbal techniques, like reflection exercises, imaginary journeys, modelling etc. to guide the process (see *Development through disequilibrium* above). There are no predefined rules for how the collaboration plays out. Therefore, facilitating adventurous learning depends on the creative and professional sensibilities of the practitioner (Sonne & Tønnesvang, 2015:153).

The intuitive practitioner explores how persons or groups, in inventive ways, are adjusting to their surroundings in order to evaluate alternate and feasible access to adequate adaptation approaches (Fuhr & Gremmler-Fuhr, 1995:208). Joseph Zinker (1977) also indicates the emphasis on interactions and the creative aspects involved in facilitation, referring to this intuitive work as an “art form”. The facilitation of experiential, situation-adept adventures needs to be practised to be comprehended, and cannot be fully captured in a manual. There is also acknowledgement for the need for transferring this intuitive reflection into a shared language and relating it with concepts and models to the existing body of thought. The challenge is to conceptualise this intuitive knowledge in a manner that keeps the connection with the actual experience alive (Fuhr & Gremmler-Fuhr, 1995:208).

In summary, Adventure and Gestaltian education apply self-actualising, leap-taking, attribution, present-investment, pacing, companionship, elasticity and intuitiveness to promote experimentation that bring out creative openings from what is existent in the present of people and situation. The principles listed above, enable a perspective-taking that embraces complexity and allows measured interventions in the intersubjective dynamics of shared situations (Sonne & Tønnesvang, 2015). Through intuitive methods and analysis, further elaborated in chapters three and six, the inner experience is correlated with outer observables for developing capacities in persons and groups. In adventurous homemaking, such capacity expansions may not only make individual lives more adventurously interesting, it may also stir more interexistent thinking and doing.

2.2 · Interexistent autonomy

The previous section surveyed the necessity of overcoming obstacles (relational self-realisation), as catalyst for the existential development of human bodyminds. This psychodynamic life principle is also an ethical directive to sociocultural functioning. In his recent book, *Design for the Pluriverse*, anthropologist Arturo Escobar (2018b:215) refers to selforganisation in life-generating entanglement with its context as "autonomous interexistence". Proposed as a vision for design, it is a way of being and doing that brings to fruition experiences, communities and ecosystems anchored in the consciousness of "radical interdependence" (ibid:20). Such autonomous design would evolve and respond from a deep commitment to the environment, community, and politics. Informed by the inventive struggle of autonomous communities in Latin America, Escobar suggests a fundamental repositioning of design practices that not just advocate socioecologically intregrative thriving, but scrutinise their very rationale of existence:

> Design can […] become an open invitation for us all to become mindful and effective weavers of the mesh of life. […] This entails designs that foster convivial reconstruction beyond the cultures of expertise and that promote a pluriverse of partially connected worlds in which all worlds strive for justice and craft autonomous relational ways of being, while respecting the ability of other worlds to do the same (Escobar, 2018b:145).

There are two main currents in the concept of radical interdependence in design: (1) *Autonomous design* as an act of liberation for opening up the discipline to the relational dynamics of all life forms; and, (2) *design for autonomy,* where each community realises a design of its own becoming and selforganisation (Escobar, 2018a).

Autonomous design as disciplinary liberation is building on the growing sentiment that design needs to be much more self-aware of the construction and destruction it is causing before it can positively contribute to long-term socio-natural flourishing (Escobar, 2018a:139). Theoretically, autonomy in regard to design is grounded as the most essential aspect of functioning in organismic systems, as already indicated by Humberto Maturana and Francisco Varela (Maturana & Varela, 1987). Akin to Adolph Beisser's (1970) paradoxical theory of change, renewal originates in what is inherent to the situation and bodymind. Maturana and Varela refer to this self-creation as *autopoiesis*, the as the fundamental feature for optimal organismic functioning:

> … the key to autonomy is that a living system finds its way into the next moment by acting appropriately out of its own resources (Varela, 1999:11).

Arturo Escobar directly relates biological with social functioning by recognising Gustavo Esteva's (2015) rationale of *design for autonomy* originating in the Zapatista movement. Autonomy in this definition is thus the ability of communities to determine the conditions and norms by which they are constituating their lives amidst humans and nonhumans. Many of the samples of autonomous design evolve around the reclamation of food sovereignty, land reserves, indigenous farming, which make personal home economies the point of departure.

2.2.1 · Homemaking autonomies

Responding to accumulative instabilities in labour market, food security, and life quality, some autonomous indivuduals and their communities seek self-determination and fulfillment through their homemaking in Latin America and beyond. Homemaking can be described as the duties and routines which substantiate the home, family and potentially the community. Homemaking extends far beyond domestic housekeeping tasks like cooking and cleaning.

In the United States where the revival of historical homesteading is coinciding with recent crafting, do-it-yourself, and locavore movements, homemaking skills include also gardening, food preservation, carpentry and sewing among others (Holm Norton, 2011:42). These self-conscious, contemporary homemakers are spurred by the desire to realise a creative and autonomous life of a producer, rather than a consumer.

The craft of daily life: Homemakers have a variety of motivations for regaining autonomous expressions of domesticity. The current homemaking revival is a broad phenomenon, and not all homemaking is oriented on empowering the self and communities. Based on a review of recently released books, the following listing (table 3) characterises the main segments in the ongoing homemaking revival (Briggs, 2007; Clark, 2008; Coyne & Knutzen, 2011; Fasenfest, 2010).

(table 3) **Motivational segments in recent homemaking revival**

Home Type	*Sentiment*	*Practices*	*Social integration*	*Environmental concern*	*Source*
Radical home	Anticonsumer, contributor, productivist	Homesteading, self-sufficiency, crafting, DIY, entrepreneurship	Autonomous-interexistent household, neighbour alliance, homemaker network,	Food self-provision is usually the key driver, thereby concern for land, water, air quality and reduction of 'waste' is relevant. This can include resource-oriented sanitation.	Hayes (2010), Kelly, Knutzen (2010)
Outdoor grower home	Self-sufficient, productivist	Gardening, locavore	Garden household, neighbour exchange	Food self-provision is important, thereby concern for land, water, air quality and reduction of 'waste' is relevant. This can include resource-oriented sanitation	Bartholomew (2006)
Indoor grower home	Hortophillic	Pot planting, hydroponic growing	Single household	Cultivation of décor plants, medicinals or kitchen herbs can provide a recreational link with the natural foundations.	Markham (2010)
Handmade home	Traditionalist	Crafting, DIY	Single household	The crafting can deepen the emotional attachment and add longevity to material goods, thereby potentially reduce 'waste'.	Woginrich (2008)
Slow home	Hedonist, reform consumer	Mindful consumption, crafting	Single household	The mindful consumption can deepen the emotional attachment to goods and services, potentially reduce environmental footprint.	Fasenfest (2010), Erin (2009)
Nontoxic home	Reform consumer	Cautious consumption, healing traditions, DIY biochemistry	Single household	Depending on integration of the health-consciousness the rising interest in nontoxic cleaners, bodycare products, and organic farming could integrate with pro-environmental behaviour responses.	Hilary, Wenner (2008), Ellen (2008)
Thrifty home	Reform consumer	Frugal consumption	Single household	Inclination for integrity of self-cultivated crops could motivate pro-environmental behaviour responses.	Payne (2011), Briggs (2008), Clark (2008)
Comfort home	Hedonistic consumer	Consumption, crafting	Single household Co-living arrangement	Pro-environmental concern depends on ethical inclination.	Mendelson (2005), Stewart (2006)
Religious home	Believer	Spiritual traditions	Single household	Pro-environmental concern depends on ethical inclination.	Margeret Kim (2007)
Preppers' home	Survivor	Self-reliance, self-defence, crafting	Single household	Inclination for integrity of self-cultivated crops and off-the-grid habitat could motivate pro-environmental behaviour and resource-oriented sanitation.	

Segments in homemaking revival: cultural cachet do not necessarily overlap with social and environmental values.

Impetus for today's homemaking practices may vary widely, from invigorating traditions, to reducing ecological footprints. Depending on sentiment, cultural context and social integration, homemaking practices can be more or less pro-environmental. There are budget-sensitive and city-dwelling homemakers that seek productive skills to raise their self-sufficiency and re-relate to the elemental foundations of human life. Others have cultural reasons and are drawn to homemaking through traditional or spiritual practices.

What stands out across recent literature on the "craft of daily life" (Holm Norton, 2011:43), is how the techniques involved are attributed as life skills among *all* household occupants, thereby elevating homemaking as a shared task and capability builder. Shannon Hayes

(2010) describes how autonomous homemaking is mobilising every member of the household into what she calls “reclaimation of domesticity” and not expecting the woman in the house to do all by herself. Harnessing handed-down recipes, home economics classes, self-help books, or gradual refinement from trial and error. In the long run this may transcend the image of the homemaker, traditional gender roles, and the societal positioning of domesticity.

Realising a fulfilling, more adventurous homemaking potential stems from a socially coordinated, personal development in close relation with the present conditions. The adventurous homemaker has the desire of living in self-coherence by relying on introspection and the physical engagement with household tasks. In this mobilised renouncement from external impositions, homemakers then strengthen their volition, expertise and relationships they need to gradually expand their self-sufficiency. Without the constant exchange with close others like family, neighbours, local farmers, or worms in the compost bin, the supportive scaffold required for grassroots homesteading is missing. Adventurous homemakers who prosper in the long run, are also able to mobilise their expertise outward and involve their communities, thereby substantiating their own household practices with social relevance and legacy (ibid:250).

Campus-wide homemaking: In the quest to revisit the relationship between people, planet and politics, homemaking has recently emerged as research subject for ecologically minded, higher education. In particular, one historic example shows how campus-wide homemaking can be integral to curriculum and tenet of an entire school. The highly Black Mountain College in Asheville, North Carolina, has relied significantly on its 27-acre campus farm for economic autonomy, equitable education and personal development (Bathanti, 2014). The art school experimented from 1933 to 1957 with collaborative living-learning environments. As part of the curriculum, the Work Program involved students and staff to collaborate side by side in maintaining facilities and running the campus homestead (Silver, 2014). Students were self-committed to cultivate the farm with a cohort of students, remaining on campus during summer break to look after crops and livestock. The student-run farm incorporated vegetable production, dairy, poultry and an apple orchard, was student-run and filled the pantry of the canteen. Food self-sufficiency was essential to keep costs and tuition at a minimum in the spirit of greater integration.

The farm work was challenging and required unconditional collaboration from people within and outside the college. Contrary to the classroom, the hierarchies on the farm were flattened. Students coming from families with a farming background were coaching their teachers on the field. Female students became known to plough the soil better than males, so gender differences were suspended when everybody needed to work together. Since nobody was an expert, the campus farm also relied on bargaining relationships with locals, including African American farmers, for mutual assistance and the exchange of food surplus (ibid).

Bargaining enables thriving and autonomy from within. At Black Mountain College and for other radical homemakers alike, bargaining is not just about negotiating resources, but also includes chore attendance in and outside the house. This way, aside from intellectual work in the office or classroom, the connection to some kind of physical work and the natural foundation was always kept alive. The word bargain derives from 'borgen', German for *to borrow*. It indicates an exchange tied to trust and deliberate obligation—returning the favour, showing gratitude, anticipating the demands of others. Sharon Hayes (2010), a self-made "radical homemaker", explains the reasons for such deliberate obligation behind the consolidated production of life and home under one roof.

> We don't need pay checks […]. Instead, radical homemakers survive on homegrown food, old-timey skills and a willingness to help neighbours. It is about both men and women who need to recommit to the home. We can take ourselves out of an economy that requires endless hours of work while others raise our kids and chemists make our food—so that we can go out and buy stuff that wrecks the planet (Holler, 2010).

Acquiring old-timey homemaking skills and relinquishing oneself from the consumer entrapments requires, besides strong conviction, also access to resources conducive to homesteading. It is a privilege not all have (Steward, 2011). The two dozen radical homemakers portrayed in Hayes' book and several hundred radical homes in the United States, tend to be of Caucasian decent, educated and have access to a patch of land. Although the radical, self-providing homemaking may be out of reach for many, the Black Mountain College points to other activity domains beyond the single household, where the craft of daily life could contribute to more pluriverse, interexistently autonomous worlds.

2.2.2 · The craft of daily life

The *craft of daily life* can entail tending to a garden, preserving food, or composting human 'waste'—socio-technical engagements which not just produce material outcomes like crops, condiments or fertiliser. Crafting daily life also incorporate bodily technique, material processes and applied knowledge. It makes homemaking techniques highly social, as well as conducive to shared working and meaning-creation.

Glenn Adamson (2007) proposes to consider craft as a cultural "constellation of properties" – consisting of skilling bodily movement, using tools, defining materials, exercising intelligence – as means to navigate, contest and validate its position in human worldmaking efforts. Long ago anthropology has argued for the relevance of craft in the cultural narrative that is not tied to its end products, but stems from its integrative processuality and performativity. Bryan Pfaffenberger (2001:84) argues that the value and status ascribed to artefacts – which could be a self-crafted house or human-derived humus – is a consequence of the meaning-formation processes involved in shared technological activities rather than their outcome:

> By bringing technological activities back into the picture, one sees human beings actively using activities to create the type of people, as well as the modalities of social relationship, that they deem vital to their community's survival (Pfaffenberger, 2001:84).

In this view, making has not just the inherent social dimension of connecting of people, materials and ideas as suggested by David Gauntlett (2011:2). Expanded beyond human agency, through technological activities, people engage – mostly unknowingly – in a profound material dialogue with forces of sustenance that not just relate to self, but to larger ecologies, indicated by Pfaffenberger. The craft of daily life then is not to be understood as mere pastime consisting of insular forms of homebound recreational activities ('crafts' with a plural 's'). Rather, it can be considered a socio-environmentally connective force – craft – that influences how autonomous people and communities can engage more consciously with the given conditions as Amanda Ravetz and colleagues (2013:6) describe:

> Through its connecting impulses, craft draws us attentively, physically, and imaginatively deeper into the connective tissue of a world we already inhabit (Ravetz et al, 2013:6).

As indicated in recent homemaker literature (Holm Norton, 2011:42), the performativity of homemaking craft can manipulate the connective tissue within the house by slowly transcending the image of domestic tasks or gender roles. Potentially, the craft of daily life can grow into a connective tissue of the local economy around a small art college and influence an generation of prolific cultural practitioners[10]. Anthropologist Tim Ingold (2011:18) points out how beyond relationality also movement is critical for the properties of craft. Movements within the body for sensory engagement; movements outside the body for reaching into the environment; and deliberately shared movements that enable collaboration and depth with materials and places. In a well-coordinated effort, such craft-led, collaborative environments could then in effect trigger social movements.

The integrative handmade: The broad do-it-yourself movement influences homemaking, which is motivated by reducing the reliance on remote others for satisfying personal needs, or what Otto von Busch (2008) sums up as the "hacking of consumer culture". The hacking appeal partly comes from localised making and the interest in the handmade. The presence of do-it-yourself inside different streams of alternative consumer culture, including indie music, independent media, urban farming, or maker culture, shape the notion of the handmade (Wagner, 2007).

The handmade is not synonymous with harmony, it is contested and political. Tim Ingold (2011:63) argues how people and environments thrive best together not in a ready-made, prefabricated world but in a continuously fashioned *meshwork* along the relations of living, growing and moving:

> […] beings do not propel themselves across a ready-made world but rather issue forth through a world-in-formation, along the lines of their relationships (Ingold, 2011:63).

In such an animating meshwork, materials are implicating the handmaker in a tangible dialogue with the imminence of decay and renewal. Making here is a co-creative participation with the forces of life. In regard to human creativity, the handmade has long been recognised to bring tacit knowledge into the experiential scrutiny through "reflective

[10] **Black Mountain College** brought forth influential faculty and students including Anni and Josef Albers, Ruth Asawa, Dorothea Rockburne, Charles Olson, Walter Gropius, Ray Johnson, Robert Motherwell, Cy Twombly, Robert Rauschenberg, Merce Cunningham, John Cage, Buckminster Fuller, Franz Kline, Elaine and Willem de Kooning and Allen Ginsberg.

conversations with the materials of a situation" (Schön, 1982:5) where "form can be apprehended through a continuous dynamic of composition and decomposition" (Mazé, 2007). The archetypes of the handmade are anchored at the home, with growing, preparing and consuming of food.

Crafting with bacteria: Probably the earliest expression of food preparation is fermentation. Derived from Latin *fervere* for 'boiling', the term fermentation points to food preservation that is understood as *cold cooking* in absence of fire (Katz, 2012; Katz & Saladino, 2017). Harnessing bacterial forces – or what Michael Pollan (2013) calls "controlled rotting" – concoctions of raw, organic inputs are de-composed to be re-composed. In lieu of fire or external energy, simply *time* is applied as material input. *Space* is applied to manipulate decay and taste. The quality of the result correlates with nurture, judgement and dexterity that the handmaker exercises in the process of mixing and matching the ingredients (Pye, 1968). Fermenting like all other handmaking activities, embodies the uniquely human condition of being both agential and exposed to the response of otherness—obviously there is generative vulnerability in handmaking. The crafter is prompted to reconcile the materiality of the object (Sennett, 2008) with the risk of mishaps inherent to workmanship (Pye, 1968).

Increasingly technology is designed for efficiency, sophistication and ubiquity. Yet, when highly technologized productivity is thoughtlessly integrated in daily activities, values like personal capabilities, local heritage, or cultural traditions can be compromised (Ihde, 1978). Juhani Pallasmaa (2009) explains how heavy, technological intervention can undermine the multisensory, spontaneous and synchronic imagination in humans. The interactions afforded in technological mediation are often intangible with the eyes participating in a screen-based process, and a device delivering the output. Such level of mediation may currently not be prevalent in the craft of daily life, yet with increasing sophistication of controllers the ability for material manipulation is diminishing. In the removal of the hand (from, the making process), the material constitution and biochemical reactions in the living concoctions become more abstract (Mccullough, 1996).

The tacit properties of the handmade may seem at odds with technological progress geared at speed, standard and precision. This schism correlates with the perceptive opposition of

improvisation (creativity) and tradition (heritage) in craft debates. Handmaking practices around kitchen and garden can be particularly challenged by these schisms, since digital technologies are gaining foothold in the home environment. Elizabeth Hallam and Tim Ingold (2014:1-24) indicate how such oppositions can be limiting. In response, explorative collaboration is essential to loosen operational confines and negotiate the boundaries of the handmade in relation to other modes of production (Ravetz et al., 2013:2):

> Whether across materials and techniques, or the borders between craft and other defined areas of practice, the cross-fertilisation of materials, processes and concepts, questions what craft is, providing makers and others with opportunities for unlearning, opening craft up to alternate ways of thinking about self (Ravetz et al., 2013:2).

Once the schisms are overcome, the handmaking has a vital place in sociotechnological advancement—be pedagogically relevant, socially committed and politically obligated. Once Ingold's (2011) *meshworking* concept weaves into the social, people find in intimate entanglement with life forces co-construct and cohabit their environment. Amanda Ravetz indicates that crafting and handmaking are too important to be sidelined:

> The fact that craft is socially and culturally situated, performative and involves proximity, makes it a potent force and one that seems highly able to adapt. We need to understand craft expertise as something that can be amended, transformed and reconstituted (Ravetz et al., 2013:8).

In this sense meshworking expressions like craftivism, radical homemaking, experimental farms, maker fares, hackathons, or integrative research initiatives can be seen as vital entanglement of materiality, design intelligence and society.

2.2.3 · Self-contracted in thriving of the whole

The crafting of daily life, in indigenous communities, avantguarde art colleges, and radical homemaking is by nature never a single household endeavour. The "cradle of self-sufficiency" (Hayes, 2010:181) emerges from the working alliance with the community that enables the autonomous homemakers. Building social capacities and cohesion, where people take better care of each other, is not only pivotal for buffering unpredictabilities or addressing problems. The lives of people that are richly meshworked socially, are coping better with personal trauma and illness (Putnam, 1995:288). Humans also want to realise their fuller potential, that reaches deeper than pleasure and primary needs. Unsurprisingly, persons who are regularly absorbed in a shared goal pursuit outside themselves experience greater life satisfaction and thriving (Layard, 2005:73).

Arturo Escobar (2018b:144) in his autonomous design framework describes the concept of "Buen Vivir", the pursuit of *collective wellbeing* for countering consumptive-oriented development narratives. Akin to radical homemakers in the United States, these communal forms are being crafted by local urban and peasant groups in Latin America, determined to safekeep heirloom seeds, customary traditions and natural resources. This collective will and a quest for autonomy is grounded in the believe that another world is possible. Such intentional coalitions occur also outside the Americas.

In Ezio Manzini's (2018:164) view, it is the quality of conversations by individuals who engage from a position of autonomy and free choice that can open up "spaces of favourable possibilities". In the debate on *social innovation*, François Jégou (2010) indicates how such positions of autonomy are relevant both on the household-level as well as top-down planning approaches. He defines the opening of favourable possibilities as transformative forces that can reach a continuum, oriented on engendering healthy conditions instead of curing problems. This points to the urgent need of meshworking the concept of interexistent autonomy into a comprehensive cultural and economic narrative that is not only more conducive to the pluriverse of life but also capturing human aspirations.

2.3 · Biological economies

Biologist-cum-philosopher Andreas Weber (2013) declares that if humankind is going to co-create more *pluriversally thriving* conditions everywhere, it is time to provide living proof of its worthiness and its competence of participating duly in biophysical life processes. He proposes to inaugurate the "enlivenment" in provocative opposition to the enlightenment. In the *enlivenment* each individual's conscious experience of being alive would integrate as active contributor in the evolution of a cultural understanding that reconciles human activity with ecological integrity. Recent sociological research on agriculture, rural development, economic geography, and human reproductive health, has embraced the idea of biologically 'enlivening' scholarly thinking and doing.

2.3.1 · *Enlivenment* in social research

In an effort to bringing the pre-eminence of life processes to the fore, and meshwork them into the debate on technological and social organisation with a more collective and performative approach, the conceptual lens of *biological economies* (Le Heron et al., 2016) or *bioeconomies* (Pavone & Goven, 2017) is heartening. The *biological economies* framework is an invitation to render the environmental dynamics and consequences of human intervention more explicit, thereby mobilising theories and methods with discourse on economical development and inequality. Both 'enlivenment' and bioeconomics are understood as critique on the concept of the *Anthropocene* or "The Geology of Mankind" (Crutzen, 2002). It is a narrative that presents humanity as the homogenous force and manipulator over an entire geological epoch. This discriminates large parts of humanity (and nonhumanity) not implicated with the fossil economy and environmental destruction, and also perpetrates the illusion that humanity can control the biosphere—both attitudes are profoundly inimical to fundamentally change course and take considerate action (Malm & Hornborg, 2014).

Living inside the *world of eaters*: The deliberately confrontational bioecological project emphasises the potential for change on the margins of human-biological exchanges, and attempts to decentre human economic thinking for engaging more fully with the volatility in environments (Le Heron et al., 2016:8). Decentring human economics can open up creative liberties by putting human food systems onto a level playing field with the entirety of biophysical exchanges, what Georges Bataille referred to as "the general economy" (Goux, 1990). In such an ontologically flattened world, the category of 'food consumers' from the world of human economic production, is replaced with the multitude of relationalities when every body – humans or not – are considered "eaters" (Goodman, 2016). Then the act of eating is an expression of mutual replenishing that is shared among all life forms. In her book *Dangerous Digestion*, Melanie DuPuis (2015) elaborates in great detail on this "world of eaters". In such a reframing, the food consumed is made absorbable to the human organism by nonhuman gut bacteria that eat it themselves. In this conception of macro-economies linked by alimentary bacteria, the human consumers are constituted by what is eating inside of them, and conversely, they feed what is feeding them.

This microbially fully implicated human body is considered a full-fleshed "agroecological system" (ibid:138) in relation to the world of eaters in and around it. In this perception the human self is expression of a continuous, living collaboration where the toilet is recognised as the most important interface in socionatural exchanges:

> One of the body's most important socio-natural objects is shit. Primarily composed of bacteria, this collaborative byproduct is what comes out of an alliance between our food system and our internal ecologies. Seeing shit in this way enables us to see how our lives are fermentive processes that create socio-natural relationships. (DuPuis, 2015:146).

Considered in this socionatural relation, shit then is the agent of life that is conditioning the soil with its bacterial bounty (Waltner-Toews, 2013), while urine is the source of energy with its abundance of nutrients that can feed agroecologies[11] (Wolgast, 1993). The optimal functioning of agroecologies, relies on the digestive and self-regulatory processes of bacteria that keep predators in check through the bargaining interactions with their particular ecology. DuPuis proposes the notion of *digestion* as opposed to *ingestion* for engaging the *world of eaters*. Digestion (including fermentation) is about engaging contiguously with a complex world. The notion of *ingestion* implies the reductive strategy of isolating internal purities from outside dangers.

In her book *Purity and Danger*, Mary Douglas (1966) illustrates how discriminating food choices – preferring the pure and evading the dangerous – have been employed to characterise society. In similar vein, Claude Lévi-Strauss (1964) in *The Raw and the Cooked,* defines society as segregated between the notions of pristine and polluted, the civilised us and the primitive others, between control and hazard. In this current reading of Douglas' and Lévi-Strauss' work, contamination is not tied to and predetermined by the properties of materials per se. What is considered contaminating or harmful stems from poor social relations and static regimes of purification where the world is simplistically split up between "in our favour", and "against our favour" as Max Liboiron (2016) points out.

[11] **Agroecologies** are the expression of an alternative on-farm development paradigm initiated by Miguel Altieri. In what is also referred as 'pluricultural research and development' encourages more ecologically regenerative, biodiverse and socially just forms of agriculture. The methods are directed by closed material cycles, perennial planting and the reliance on internal resources for strengthening buffering capacities in local ecosystems to withstand disturbances. Altieri has coordinated efforts with the United Nations' Food and Agricultural Organisation (FAO) to contemporize indigenous farming knowledge and assisted peasants in Latin America to increase their food sovereignty (Altieri & Toledo, 2011).

DuPuis (2015:148) recognises how the messy dynamism of *digestion* and fermentation is indeed troublesome for humans to swallow. Compared to the illusory but alluring freedom of choice and control, in the *ingestive* paradigm, digestion always entails bargaining with the unsafe. Yet, precisely such imperfect and transformative socionatural alliances can engender a way of being and acting that make humans fully implicated members of the world rather than an avoiding opponent living in unhealthy ignorance:

> If ingestion provides the metaphor for a narrative about safety, the dangers excluded, digestion stories tell us about how people live with the choices they have made. Digestion is the story of the world made through alliances and the uncertainty of that process (DuPuis, 2015:147-8).

After people made decisions there are always path dependencies: long-term consequences like conventional agriculture, suburban sprawls, nuclear power, plastic-reliant industries, that ecosystems and people have to live by.

In what DuPuis calls "treadmills of purity" (ibid:11), the predominant reliance on narrow control and sanitation regimes, is neither able to fully contain, nor prevent bacterial pandemics. It rather restricts biological and social flexibilities crucial to absorb and adequately respond to unpredictabilities intrinsic to all living systems (Le Heron et al., 2016). The digestive paradigm from the *world of eaters* recognises the vitality of materials, the importance of nonhuman actors and the need for contingent socionatural bargaining on small and large scales to redevelop potentials, reservoirs, buffers and resources:

> Since we can't wall ourselves off from the risky world of untrustworthy actors and institutions and tricky bacteria, we need to work with them. So, we are left making bargains for our safety with those who will not make us fully safe (DuPuis, 2015:158).

With this recognition of instability, fermentation as paradigm in human decision-making, is not to be understood as chaos or anarchy, rather the cultivation of integrated ways of collaborating and governing. In such fermentive-fomentive approaches, decision-making necessarily derives from a process of shared learning in what could be considered as "panarchy" (Le Heron et al., 2016). From its Greek roots – *pan* for 'other' and *archos* for 'ruler' – panarchy points to a truncated hierarchy, where governance encompasses all others involved.

In agroecological learning programs, the 'all-ruling' panarchy is a viable response to wicked, socio-environmental challenges where problems are opened up with others instead of trying to solve them in homogenised ways (Carolan, 2017a:173). In this collaborative research the teacher is learning about the challenges from and along the students. Bringing peasants into the classroom and students into the messiness of the field, is key in such integrative approach to learning. It means to unbound science development inside what Melanie DuPuis (2015) calls "extended peer communities". This generates fresh kinds of knowledges that stem from observing, noticing, describing and conceiving. Such dialogic-scientific knowledge creation commits nonexperts and laypersons, and is described by Bruno Latour as "collective experiment" where for instance hospital patients are co-creating their respective science policy (Latour, 1998). This fermentive permeability in making knowledge for more integrative governing, also takes into account the likelihood of failure:

> Fermentation is risky and, like collaborative political processes, is always somewhat uncontrolled and unpredictable. It is, however, tolerant of mistakes. It also involves trust, because of its unpredictability and imperfection (DuPuis, 2015:146).

Long before refrigeration, sanitation and pasteurisation, it was fermentation that preserved foods, making them more nutrients-rich and flavourful. In this sense knowing, prefiguring, doing and engaging more delicately and flavourfully with socionatural constitutions, will require novel experimentations. It is in the creative tension of unfamiliar connections, confrontations and commitments, where practices and thought can be grasped, represented and enacted (Le Heron et al., 2016).

2.3.2 · *Enlivenment* in social design

Akin to "extended peer communities" (DuPuis, 2015) from the *bioeconomies* discussion, social design is about experimentating with novel social forms toward knowledge-making. This study draws on diverse disciplines and thought and finds itself challenged to snuggly fit into predefined traditions of social design. While this study has idealistic intent and is motivated to bring social causes to the fore and into daily life, it is not loyal to any particular expression in *social design*: this study is not engaging with existing social processes to name it *service design*; it is neither embedded in a specific social setting to name it *community design*; it is not destined to the political arena to name it *design activism*; it is neither oriented to institutions to name it *public design*. What makes this study *social* is in the

objective it pursues. Since it emerges from the interest of testing out unconventional, collaborative frontiers for uncovering potential in what usually is disregarded.

Ilpo Koskinen (2016:28) proposes “new social design” for describing more recent design processes and methods where the engagement with social matters is of primary concern, rather than the material outcome it ensues. The common denominator for new social design is its positioning outside the market. Based on where its aesthetic propensities are situated, Koskinen observes three major tendencies in new social design: agonistic, convivial and conceptual. In the agonistic inclination, the aesthetic is in the defamiliarization or strangeness of designs for provoking discourse. In the convivial inclination, the objective is to set the foundation for sociability, and the aesthetic stems from its exchanges and group dynamics. In the conceptual inclination, the aesthetic derives from daily life which is captured and transcended for social causes.

In relation to the aesthetic propensities in new social design, this study is ambiguous and situated on two trajectories since it strives to generate a durational collaboration for implicating interested parties and exploring wicked issues. While value is provided in the convivial, the study’s intention is the agonistic upcycling of human ‘waste’ as socially mobilising research. A diverse range of people like farmers, scientists and laypersons are brought together who normally would not meet. Thereby the aesthetic propensity is in the social dynamic for enabling a process that is left untouched or relegated to planners and engineers. This would align with Rancière’s (DiSalvo, 2012) theory of aesthetics that connects with adversarial design strategies.

Yet this study is focused on mobilising social forms. The aesthetic intrigue is not primarily aimed at provoking a debate as in Dunne and Raby’s (2013) work in critical design. This study seeks the conversations from collaboratively intercepting with daily homemaking, as trigger for transformation. It is the aesthetic propensities in interactions and group that ought to propel the durational process. The issue on hand also requires courage and persuasion, thus designers use their judgement in the traditional sense of design’s formal aesthetics to lure participants through methods and products deployed.

Being positioned within *new social design*, the study deploys aesthetic intentions in both the agonistic and convivial domains. It is agonistic because the aim of the work is to stir up people, nudge their routines, and trigger reflection. Along the iterative process, disciplines and parties who ordinarily would not intersect are brought into collaboration. This brings seemingly remote issues into daily life, opens up new dialogues and creates forms of knowledge that otherwise cannot be accessed. It can be considered an activist form of conviviality that seeks to bring challenging issues into communal consciousness and interaction. In this way the aesthetic form is vacillating between agonistic and convivial for facilitating experimental collaborations. Aside from common social forms like trainings, exhibitions, and discussions, the study seeks adventurously social forms to bring forth the issue on hand.

2.3.3 · Relevance of existential (re)engagement

The preceeding literature review has established that there is urgency in pulling existential needs – awareness for bodily functioning and emotions – back into daily life and shared consciousness. It is only in the ongoing moving-physical interaction with the biological world that persons and organisations are able to advance their abilities for flourishing in themselves and the very conditions they depend on. The importance for accounting to existential needs in design research can be summarised with the following three quintessential aspects:

(1) Mobilisation relies on unifying, existential ambiguity: A gargantuan of data, knowledge and believes are being produced, yet little consequential validation and reflection is taking place. There is a need for explorative practices to implicate diverse ranges of people in confronting complexity in existentially relatable ways so that concerns gain immediacy in the day-to-day life choices. Unless people can reconcile on bodily level how the biological foundation is impacted by human activity and vice versa, flourishing is going to be increasingly restricted. Tolerance for failing and forging unpredictable work alliances are crucial for leap-taking and countering hegemony because they ensure creative tensions through dynamic coregulation (Sonne & Tønnesvang, 2015; Brown, 2012; Halberstam, 2011; Dewey, 1997, Zinker, 1977).

(2) Restructuring requires existential boundary awareness: Without the aware engagement with the unfamiliar, the opportunity for people or organisations to substantially change their operational logic is easily foregone. This *restructuring* type of learning only results when individuals or groups make contact simultaneously with environment and their feelings. Transformational insights are gained from registering what is occurring, *while* it is occurring. This uncovering potential from correlating outer observables with inner sensations, is the reason why unconventional, social experimentation is essential. Research here is challenged to conceptualise intuition and behavioural responsiveness so that knowledge maintains a living connection with the actual experience (Overhill, 2018; Sonne & Tønnesvang, 2015; DuPuis, 2015; LaMothe, 2015; Perls, 2005; Fürst, 1996).

(3) Futuring capabilities reside in existential homemaking: The revival of craftivism, experimental farms, maker fares, hackathons, etc. demonstrate the innate desire of humans to participate in the life-affirming entanglement of materiality, expertise and society. Handmaking is essential in staying internally resourced within the socio-material affordances of the present situation. In extension, the crafting of daily life is about building life skills and sharing tasks in the existential exchanges of body and the environment. Homemaking in this interexistently autonomous expression deserves much more appreciation as the primary place of production for personal self-coherence, social transformation, and long-term welfare (Escobar, 2018; Ingold, 2011; Norton, 2011; Hayes, 2010; Fry, 2005; Friedländer, 1918).

With an adventurous spirit, autonomous connectedness, and through enlivened exploration outlined in this chapter, the following research formulation is informed to formulate the research intentions aimed at existential ability building.

2.4 · Research formulation

In summary, the theoretical research perspectives indicate how integrated, evolutionary processes across life arenas – in organism or group – stem from what is accessible within the given situation. Cohabitation and well-functioning are based on interexistent autonomy, the dynamic of self-realisation in each living entity that is only possible through tangible coordination – volition, touch, response – with resistances encountered. True long-term flourishing stems from relatable alliances grounded in the commitment to time, difference, transperency and trust.

Truly integrative collaboration that meshworks sensibly inside biological economies originates in a dynamic tension of intuition and broadmindedness to open up problems as well as foresight needed to expand narratives, buffers, reserves, and capacities. These perspectives are epitomised in the three evolutionary principles, described in Tom Atlee's (2009) book *Reflections on Evolutionary Activism* which entail (1) self-investment anchored in the flourishing of the whole; (2) fostering diversity; and (3) continual adaptation with the unfolding situation. Atlee's principles for cohabiting the pluriverse in shared wellbeing align with the theories above and guide the formulation of this study.

The theoretical perspectives above traced the cultivation of movement patterns that all assemble a commitment to formulating more pluriversally thriving worlds. From this commitment to worldly engagement, three research drivers emerged that lead into methods and work approach of this study. Setting up movement patterns for eaters in a 'world of eaters', either directly or indirectly, is what can create an embodied engagement with the environment and form commitment, motivation and action in urban cohabitation. In the sections above the three main themes of thriving in relation, learning through arbitration, and overcoming in engagement are prevalent. Deriving from this, the study established (1) agroecological pedagogics, (2) mobilising experience, and (3) failure-friendly generativity as conceptual formulation to conduct research.

2.4.1 · Agroecological pedagogics

Tom Atlee (2009) indicates, how self-interest in the welfare of the overall condition is at the heart of enduring thriving. The previous sections indicated how continuously vacillating movements between short-term needs and long-term prudence allows for flourishing in biological and social ecologies. Biological flourishing stems from absorption along reproduction; mental flourishing from desire along duty; collaboration from agency along alliances; and learning from challenge along support.

Movement needs a direction, guiding, instruction, a protocol. The study sets out with the trajectory challenge by asking, what if the metabolic relation between human and the environment could serve the flourishing of social and natural ecologies. What if "the body's most important socio-natural objects" (DuPuis, 2015) – commonly referred to as human "waste" – could actually serve simultaneously the wellbeing of natural as well as human ecologies. What if human 'waste', with its untapped agroecological potential, could become a measure for grasping and learning about the health condition across species? What if collaborative adeptness could transcend disciplinary boundaries and negotiate mental barriers to try out the reconstructive use of human 'waste' in urban context? What if design could enable people to experience their agroecological role in relation to nonhuman life and act upon?

Admittedly, such propositions are a tall order. Yet, high endeavours, the possibility to think bigger about how life is lived and what humans can do in the world is precisely what adventures are about as Matt Walker (2011) indicates.

Robert Stevens (2015) describes how in agroecological systems, feeding is the crucial exchange among living organisms. He points out how akin to birth and death, composing and decomposing in metabolic exchanges are the "interpenetrating processes for renewing life" (2015:201). The common preconception of contemporary life is certainly challenged with the restrictions imposed by the concepts of decomposition and death, yet it is the participation in such transformation processes that make life forms such as the human possible. Stevens points to the mortal muscle cells in the mortal bodies, giving humans the ability to move and to bargain for a thriving co-existence with their environment. Comparable to Tim Ingold's meshwork, Stevens explains how craft, as an expression of adeptness in socionatural

engagement, allows to expand that mortal body into a shared interaction with the world (ibid: 118-122).

Adeptness in agroecological pedagogics would allow people to engage with health information present in both body and environment. Deborah Lupton (2018) describes what she calls *biopedagogical systems* where tracking technologies and human sensemaking are brought together to deliver personalised indicators that are useful for self-care and prevention. *Biopedagogical* initiatives certainly account for the nonhuman materiality as well. Articulated by Jane Bennett (2010) in what she refers as "vital materialism" and the "thing-power", the agency of nonhuman things and how they influence people's lives is increasingly acknowledged and researched. In other words, dependent on the interaction with humans, socionatural materials like human 'waste' have capacities which actively contribute to positive or negative effects.

2.4.2 · Setting joint goals, mobilising abilities

The strength in collective experimentation originates in embracing diversity (DuPuis, 2015; Latour, 1998; Le Heron et al., 2016). In this knowledge-making from the messiness of the field, striking bargains with unlikely partners leads to extended forms of learning. Humanist and experiential education indicate the import of disequilibrium that is conducive to advancing onto a higher level of reflection: it is in the conjunction with incomplete situations, where people relate to others, cultivate values, and strive to overcome challenges (Dewey, 1997; Kimball & Barcia, 1993; Sonne & Tønnesvang, 2015).

Experimentation thus can be considered an adventure of the mind-body that constitutes intention, focus and otherness. This adventuring in relatedness can bring forth capacities beyond the isolating adventure of the headstrong daredevil or extreme opportunist. The adventurous mentality comes from the recognition that leaping forward in the face of challenges is anchored in alliances of support and companionship. The issues on hand are too big to be tackled alone (Gilsdorf, 1998; Walker, 2011). It is precisely adversity and unease that characterise adventures as Matt Walker points out:

> Adventure always has an uncertain outcome. A predetermined outcome is not an adventure but a packaged experience or amusement ride (Walker, 2011).

Unbounding the experience is not just about getting comfortable with the uncertainties of life but needs to resonate with a results-obsessed world. Adventurous exploring, doing and learning is then about defining and redefining goals that at the same time captivate, open up and unify the engagement of people, since their interests may be very diversified (Ehn & Badham, 2002). It is then about implementing goals in collaborative adventures that stir and maintain interest in group and individual. It raises the question what motivates people to take the leap, invest in uncertain alliances, yet are able to find fulfillment regardless of the outcome.

People have basic psychological needs for mastering developmental tasks which are particularly relevant in ambiguous situations. Widely respected in developmental coaching and education is *self-determination theory* by Edward Deci and Richard Ryan (Ryan & Deci, 2000) for understanding inherent growth tendencies. Self-determined people engage in their actions grounded in a consciousness for self and other. To be self-determined is the liberating experience of personally realising what is stimulating, significant and compelling. Self-determination theory recognises how psychological dynamics unfold in social settings which in turn structure motivations and reasons for actions (ibid).

Deci and Ryan (2000) describe how psychological wellbeing depends on mental autonomy, competence and relatedness. Most motivation research has focused on the psychodynamics stemming from the individual's needs for choice, control, self-efficacy and belonging. Only recently, the dynamics underlying reasons in transpersonal goal pursuit are being explored and validated (Gore, 2014; Gore et al, 2018). When people adopt shared interests and motives for collaborating on mutually beneficial goals, they are likely to have more fulfilled experiences and overcome obstacles easier (Reis et al, 2000). There are models of transpersonal motivation dynamics that are applied to clinical studies for identifying why people integrate relational and longer-term interests into their own. This study will explore ways for adapting such frameworks to "participation in the wild" (Huybrechts et al., 2014) for better understanding the psychodynamics in collective experimentation.

2.4.3 · Failure-tolerant bargaining for success

Adventure and experimentations entail uncertain outcomes and are programmed to produce failures. As outlined above, experimenters intent to stirring the status quo need to be tolerant of adversity. In the loosening of expectations springs up the ability to conceive and grasp the insights or possibilities springing out of failing (Elias, 2012; Walker, 2011).

Education literature reveals how failure is stigmatised. Particularly in competitive situations failure is not an option and often viewed as the outcome of poor performance. To reduce the damage to self-worth in the event of failure, people tend to resort to procrastination, impostor fears, disengagement, self-handicapping or defensive pessimism that is referred to as failure-avoidant behaviour responses (Elliot & Thrash, 2004). Failure-avoidant tendencies are completely counter to experimentation and extended learning. Even as people may achieve outstanding performances in standardised tasks or routine learning, they can be unable to overcome small obstacles and simply surrender. Such failure deprivation can be a major hindrance to personal expression and development (Bennett, 2017).

In what can be considered remedial education, Harvard University has launched a Success-Failure Project[12] that tries to destigmatize failure. Here support is given through exchanges about struggles and setbacks and students are asked to lean into failure so they can grasp insights and learn from mistakes. In this explorative study the issue is to facilitate dialogue that feeds on failures which then become entry points to reflection and resolution. It is to be explored what factors influence the responses to failing. What prompts the ability of being responsible for, obtaining learning from, enduring or avoiding mistakes and what are the implications for mistake-tolerant collaboration.

This chapter explored the underlyng concepts in sociopsychology, sociology, craft and design in regards to ability-buidling in individuals, groups and research. Adventurous social forms endorse people in acquiring adept ways to respond to challenges otherwise not addressed. This research is therefore interested in exploring methods that can instil as well as nurture new practices where wicked issues, messy collaborations and failure become part of developing human capacities.

[12] The Success-Failure Project at Harvard University invites students to question their success rational by scrutinising what aspects in life provide fulfillment and to what level personal goals are imposed or self-determined: https://bsc.harvard.edu/success-failure-project

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2

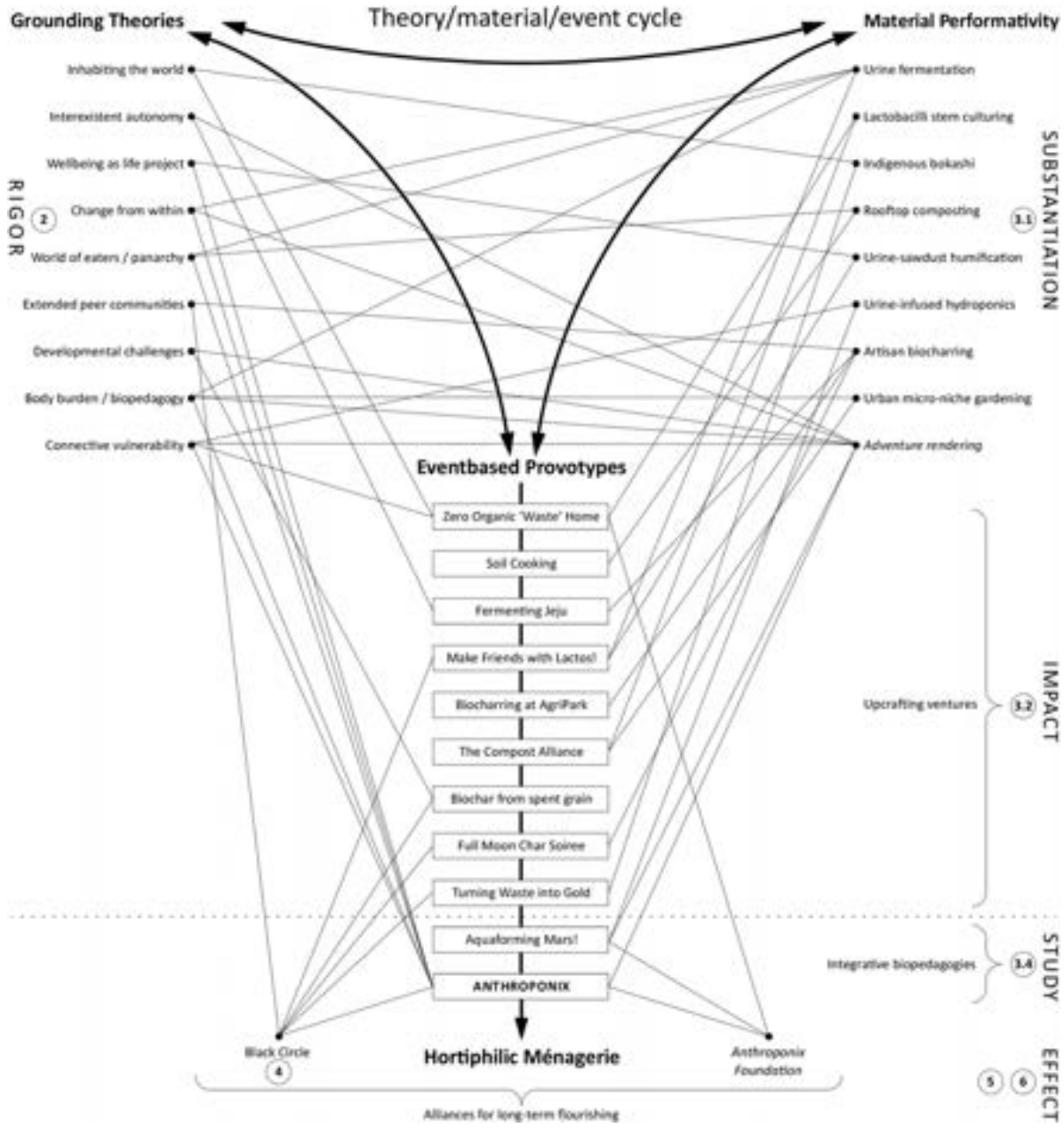
Grounded Mobilisation

This chapter fleshes out the methodical and analytical considerations which underpin this exploratory and endorse its intention with rigour. By activating the social potential around digestion, craft and everyday habituation, this study addresses the lack of bioecological integration in the current conception of homemaking. The main objective of this research is to explore communal engagement with bio-remedial techniques (fermentating and composting) to spur more sensible exchanges between humans and environment.

This exploration for reclaiming existential domesticity with human 'waste' as codesign material, brings issues of acceptance and durational commitment to the fore. In response, unconventional socio-material approaches are evaluated where working with human 'waste' becomes a desirable proposition. Since developmental work with biological entities and processes (in humans and nonhumans) entails uncertainty and endurance, this research also seeks to better understand the underlying experiential dynamics that endorse the individual and group in durational collaborations.

In such materialising-explorative research that brings together people, households, and knowledge, methods needed to be thoughtfully devised for ensuring guidance, rigour and sensitivity to context. In response, ‘grounded mobilisation’ refers to a combination of methods where grounded theory is applied to practice and material substantiation. Grounded theory derives from the comparative analysis of literature and data (Glaser and Strauss, 1967) foremost to inform existing or new theory. In extension, ‘grounded mobilisation’ is an analytical enactment of literature and data trough socio-material engagement that informs the emerging practice through responsive, social experimentation as indicated in the following diagram (figure 6).

(figure 6) **'Grounded mobilisation': Circular, socio-material, practice-led research**



'Grounded mobilisation' refers to constant-comparative research which results stem from the mutually informing oscillation between theory discovery and material experimentation which configure the social exploration in everyday context. It is a circular research based on reflection, material practice and public action.
The numbers refer to chapters and sections in this thesis.

The 'theory/material/event cycle' in the diagram above comprised the three determinants of grounded theories, material performativity, and event-based provotypes that ensured a constant analytical correlation between literature, material application, and social experimentation. In the real-world context it meant that the ongoing literature review (presented in main text of previous chapter) informs and is informed by the material testing (articulated in footnotes of previous chapter). Both the grounding theories and material performativity are feeding into the event-based provotypes which in turn validate thinking

through practising. Grounded mobilisation therefore is a learning cycle where simultaneous analysis and application is shaping technique and collaboration that feed back on each other.

This research is grounding the inhabitation of lived materiality (in the social and everyday) with the knowledge exchange intended to expand the potential for action. Accordingly, this researchful 'theory/material/event cycle' starts from a *specified topic* – engendering commitment around 'biological humanity' including human 'waste' – that is brought forth methods formulation, field experiments, participatory study, and interviewing.

Grounded theory allows to embrace and account for people's concerns that the topic raises, and implement them consequently in the development of the inquiry (Brown, 2012:251). The study applied in tandem grounded theory and materialised inventiveness with participatory action events[13] to support each other. Material performativity that was *conversant* with theories led to resourceful collaborations which in turn generated data to be examined for grounded theory analysis. The emerging concerns of the people involved, directed the methods and theories for mobilising responsive activities. This approach of grounded theory that translates into tangible events of activation is here referred to as 'grounded mobilisation'.

'Grounded mobilisation' approach: When entering collaborative research, the outcome and the findings are rather unpredictable. Adopting the grounded theory approach, as pioneered by the qualitative researchers Barney Glaser and Anselm Strauss (1967), allowed to adjust interventionist methods in direct relation to what mattered to the participants and context. Through the materialising conversations in the craft collaborations, feedback from participants, media responses, and event commissions, the concerns could be swiftly identified and methods in the field experiments were respectively configured. In this way, the inquiry gradually changed its intention from *learning* about the possibilities of the situation (concern for *acceptance*, see 4.1), toward *adapting* to the context by exploring value propositions to society (concern for *productivity*, see 4.2 and 4.3), to eventually taking aim at *flourising* as the life-conducive mobiliser and justification for upcycling human 'waste'

[13] **Participatory Action Research (PAR)** is commonly applied to organisational improvement initiatives in the educational and public health sector. Anthropological criticism to PAR indicates how this collaborative research approach can cement institutional and social hierarchies when it moves vertically from the Global North to Global South, from the 'developed' to 'lesser developed' context, and from the researcher to the community (Fals Borda, 2008).

(concern for *practicability*, see 4.4). The concerns that surfaced from responses of participants, host organisations and nonhuman collaborators (such as bacteria and plants), simultaneously formulated relevant themes, literature discovery, and the next responsive activity. This way thought was pulled into enactivated research through material interventions which in turn enactivated new thought across disciplinary borders.

Over two years, this movement cultivation between theory, materiality and action has grounded the field experiments and eventually led to the formulation of the main study. This intensive, in-group collaboration captivated 22 participants for at least six weeks which allowed to collect a wealth of primary and secondary data from the procedural interactions. In grounded theory the concerns are evolving in relation to changes occurring in circumstances and participants. Initially, the research started out by seeking to learn about the mechanics behind persuasion and desire for making adversity acceptable in people's daily lives. This quest was upended when the main study began to miserably fail in technical terms—yet against the odds, everybody stayed on. In this turn of events the interviewing addressed the failure-resilient participants to find out what made them stick to a technically *lost cause*, and the research focus turned to the relational dynamics of goal pursuit and motivation. The contributions of the research thereby shifted from matters of communication, to matters of joint coping and failure tolerance.

Grounded theory also allowed for an adaptive research design with constant-comparative analysis detailed in section 3.4 at the end of this chapter. Research through design – understood in this study as *research through collaborative craft* – with a strong focus on process, is often regarded as lacking proper documentation that impairs its contribution to knowledge (Agnew, 1993; Frayling, 1993). In response, upon the completion of the main study, much attention was given to inductively process the collected data over several iterative phases of analysis where emerging categories were reconciled with theories from pedagogy and social psychology to be eventually rendered into workable, visual models. Before diving into the methods deployed, the multifaceted role of the researcher needs clarification.

Facilitating mobilising and grounded research: The researcher in this study was in the role of the instigator, mediator, facilitator, and co-participant while convening between community, scientists, practitioners, and learners. This interlocutor position allows to translate between insiders and outsiders that opened doors to knowledge transfer and funding. With such a multi-facet role, the researcher had to be conscious how there is authority and power at play. Inadvertently the researcher has certain influence – or may be perceived as someone who determines – what is important to the study, how to conduct the study, what knowledge is utilised in the explorations and how and to whom the results of the research are being disseminated (Vähäsantanen & Saarinen, 2012).

Self-restraint in regard to the researcher's authority and preconceptions has not only ethical implications. It is a prerequisite in the 'grounded mobilisation' approach. While the mobilising researcher is steadfast committed to the research topic – the unresolved situation – it is essential to have confidence in what is *emerging* so that insights inherent to situation and persons can reveal themselves. The researcher has to give license to participants and the context for redefining the research problem on hand which requires to let go of fixed ideas and self-invested interests. Besides entrustment, the participants need to be given voice and agency in the collaborative processes, so that they are not relegated to mere knowledge contributors. In this sense, the mobilising researcher is employing 'ability-oriented practices'[14] in combination with inventive engagement strategies, to activate people for becoming equal co-researchers in their own right. Ultimately, 'grounded mobilisation' ought to endorse people to be in charge of their own *life project* and biographies (Dewar & Sharp, 2013; Hitchings, 2012; Lawson et al, 2015).

[14] **Ability-oriented practices:** By mobilising the physical with spiritual, and the political with aesthetic, **Joseph Beuys** amplified ecological concerns. In his work he was concerned to cultivated primordial potential – intuitive knowing of what is situationally adequate – as ways of socio-natural healing processes. In what he referred to as 'sculpting' of social, political, and economic arrangements, Joseph Beuys made human demeanour the central ingredient of his work, by implicating it into environmental destruction and long-term flourishing. Beuys' call to task that 'every person is creatively forming their own biography', meant that participation in passivity or activation is carrying abilities and results into the future for society, individual and environment. Participation for Beuys meant that every person's thought, action and inaction is counting for eliciting standpoints and influence in the process of ability-opening societal selforganisation. Beuys recognised how societal arrangements do not sufficiently bring to fruition the individual's abilities which he saw as the basis for advancement of humankind. Looking beyond its ethos and mysticism, all of Beuys' work thereby instigates the question how such ability-opening participation between people comes alive (Adamopoulos, 2015; Eichel, 2010; Weintraub, 2012:210). In contrast to Beuys' work which focused on internal goals and ecological consciousness from within, **Friedensreich Hundertwasser**'s oeuvre is attributing ecological consciousness primarily onto function and aesthetics. Hundertwasser who advocated the reuse of human 'waste' with his *Humus Toilet,* tried to solve challenges by applying principles of biological ecologies into human-made structures (like architecture) and is considered as a pioneer of biomimicry (Weintraub, 2012:85).

3.1 · Material performativity

Grounded research is held together through a proposed topic that provokes concerns from people involved to direct the course of inquiry. In this study the instruments directing these concerns employed besides language also existential and socio-material processes. As indicated in the previous chapter (2.2.2), the meaning attributed to materials (which can incorporate human 'waste') derives from the shared technological processes rather than the end result (Pfaffenberger, 2001:84). Material performativity in this study was a way to disclose technological activity and make it accessible for engaging more consciously with the given situation as indicated in craft research in the previous chapter (Ravetz et al, 2013:6; Gauntlett, 2011:2; Adamson, 2007).

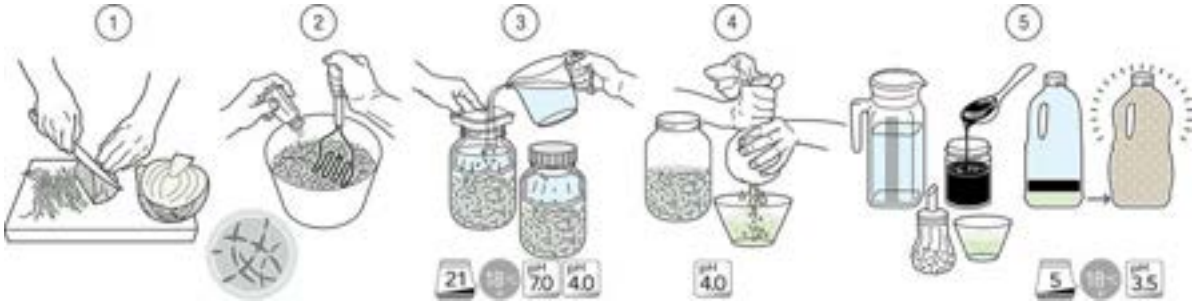
A key element in this materially substantiated derivation of concerns were the primary fermentation experiments with urine (and to lessed degree faeces) on the rooftop of the researcher's apartment house. Making this practice accessible meant that it was approachable, self-authenticated through use, and wide open for appropriation. Approachability came from the bio-fermentive processes that were given a deliberate place for interacting on the rooftop, during outreach demonstrations and dissemination efforts. Self-authentication meant that rooftop visitors or event audiences were asked to contribute physically to the manipulation of biological materiality by using the urine-diverting, collection toilet (instead of conventional options), help turning the compost, assist in agitating ferment containers, or looking after the seedlings. The invitation for appropriation came from the fact that the material explorations were an ongoing work-in-progress in need of improvement. Rooftop visitors and workshop bystanders thereby were prompted to fill the gap with expertise or questions relevant to themselves.

The material performativity taking place in compost bays, fermentation vessels and planter boxes reached far beyond social inclusion. The applied material experimentation was usually the point of origin and return for engaging with theory as well as the public in an effort to contemporise and apply agroecological knowledge. The 'grounded mobilisation' diagram above (figure 4) displays how this substantiation practice interconnected with theories, provotypes and social impact. For example, pioneering the practice of lacto-fermenting urine

in close collaboration with environmental scientists (microbiologists) was not just about consultating technical literature. Since the experimentation was conducted in the context of researching everyday home practices, it had immediate experiential, corporeal, and socio-political implications too.

The purpose of lacto-fermenting urine is to stabilise its nutrients and odour through close collaboration with unruly biological entities – as shown in the in the sequence graphic below (figure 7) – instead of controlling them with inputs of external energy. As indicated in the previous chapter, the regenerative bargaining alliances with 'unsafe' bacteria – so essential to organismic flourishing – can be expanded to social theory with paradigms like panarchy (Carolan, 2016b) as expression of distributed governance, and paradoxical change (Beisser, 1970) as context-sensible development potential stemming from what is already inherent to the given situation. Due to its relative ease of implementation and timely returns, the urine fermentation practice was pivotal for most successive experiments and events.

(figure 7) **Generation of lactic acid bacteria for urine fermentation**



Preparing lactic acid bacteria (lactobacilli) for urine fermentation starts with finely shredding cabbage [1], then mushing it with a pinch of salt [2], before stuffing it into a Mason jar with a water-filled pouch as a weight. Sealed from air access through its own liquid, the mushy cabbage ferments in a succession of anaerobic bacteria where lactobacilli outcompete other microbes over three weeks [3]. After fermentation the brine is extracted (using a cheese cloth) [4], and then propagated into urine inoculum with the addition of molasses and still water (within five days) [5]. One part of this inoculum is used for stabilising eight parts of source-separated urine which ferments within three weeks. Later on, the lactobacilli stem culturing *made these procedures obsolete.*

The practicality concern raised by time-pressed urban residents involved, triggered consecutive experiments with *stem culturing* of lactic acid bacteria. Rather than restarting the fermentation process every time from scratch (obtaining inoculant from sauerkraut or industrial strains), labour-saving approaches were explored where the bacterial mother culture was continuously replenished with a readily available nutrients solution. Such a

technique allows to scale up urine stabilisation for a variety of applications. This advancement allowed to become more daring, and consider urine as fertiliser in water-based planting (hydroponics) which is gaining popularity since it minimises the use of space and weight compared to soil-based planting. Yet, venturing into the frontiers of indoor horticulture made this research vulnerable to uncertainty, failure and human frailty that can be both a driver for bonding or humiliation as literature indicates (Brown, 2012). It meant that material performativity was not just about the communal substantiation of biological processes but gradually influenced the socio-analytical techniques employed. The substantiation of exchange processes for bringing forth evaluative rigour, was extended to describing the existential dynamics in persons and groups. The *adventure renderings* outlined below (3.4.4) and detailed in chapter six, are the result of a materialising-conversant continuum where the tension of visually tracing existential uncertainty and support becomes the impetus for interpreting psychodynamic journeys in the parties involved.

3.2 · Event-based provotypes

Grounding theories and material performativity were the mobilisers behind the event-based provotypes, and the constant-comparative check with reality in this research. Initially these small-scale social experiments were about feeling out potential avenues for approaching the stigmatised topic of human 'waste'. Through small, action-based, socio-material events (change experiments) different cultural framings of the topic were explored, and deliberated-in-the-doing. The intrigue of research utilising human 'waste' comes from the fact that it can be conducted for myriad different reasons. Reclaiming human 'waste' can be motivated by an ethical call for duty, pioneering sensible cultivation technologies, reintegrating with agroecologies, upskilling to accommodate basic existential needs, expanding one's self-sufficiently, or engaging biophysically in *ecohealth improvements*[15].

[15] **The Environmental Health Clinic:** Natalie Jeremijenko initiated at New York University a clinic that was designed to instil self-directed and participatory action by approaching health as potential based in the environment, not in individuals. Alike a regular clinic, people (who could be regarded as 'environmental patients') made appointments with the environmental health clinician to address concerns of external health influences and went home with a 'prescription' that listed concrete actions. People were instructed to collect local eco-data, launch homegrown urban improvement initiatives, and engage in corresponding activities and organisations. This way social change and environmental health was ultimately the responsibility of every individual akin to traditional healthcare (Weintraub, 2012:210).

The researcher was cautious not to focus too much on human 'waste' alone, and instead contextualise it in the larger ecologies of mind, utility or ability potential.

The first phase consisted of event-based prototypes, such as the *Soil Cooking* demo presented at educational farms, or the open-door 'composting experience' at the researcher's *Zero Organic 'Waste' Home* further described in the next chapter (see 'artful stagings', 4.1). Alex Wilkie (2014:480) indicates how 'prototypes as events', can suspend and make way for new body-technology arrangements. They inevitably produce unpredictable outcomes, which in turn can potentially deepen insights, nudge practices, and give orientation to the problems. Exposing rooftop visitors and audience members at the agroecological demonstrations, shifted the concern of the research from the materiality of human 'waste' – assumed to be mainly a matter of acceptance – to the organisational implications of human 'waste' as a matter of commitment. Visitors and onlookers of the composting events could experience first-hand how the sensible fermenting conversion of human (and other organic) 'waste' into veritable humus. Still, they could not fathom to invest themselves in the substantial efforts required in that agroecological conversion.

The first phase of learning was about hosting 'generative confrontations'. The unassuming farm visitors, curators, and neighbours were implicated in the thematic of *unwasting* human 'waste' through play and intrigue of aesthetic, companionship or techniques. This method of participatory incitement with unfamiliar socio-material mixings can be referred to as *provotypes*. Laurens Boer and Jared Donovan (2012:388) describe artefacts or interventions which embody and utilise these generative tensions as provocative types, abbreviated to "provotypes" (ibid). Human 'waste' was put up for collaborative reflection on the urban rooftop, workshop table and the gallery floor, thereby bringing about conflicting perceptions and contentious interests. There was provocation in the first encounter during the compost demo. There was provocation in using the dry toilet in the gallery or researcher's home. There was also provocation in hindsight when reflecting upon these provotypes. Since it was up to participants how much they dared to engage with the events-cum-provotypes – weather to nosedive into the compost heap or *test-drive* the bucket toilet – there was choice given as to how to engage that could range from embracement or estrangement. This highly explorative phase that bordered on speculation was not able to delineate what the possibilities are for human 'waste' in the urban context. Yet, as collateral impact, both polite

avoidance as well as creative engagement made human ‘waste’ into a resource of collaborative ideation. The visibility of transformative fermention process in the provotypes resonated well with some visitors, neighbours and audience members. It led to the formation of a loyal cohort of collaborators which opened an invigorating design space for more context-informed probing.

After the initial learning phase had provotyped the usefulness of human ‘waste’ as a design material, the concern shifted to exploring more applied engagement scenarios. The secondary phase sought adaptation to context by reaching out to established sectors of society, such as government, education and business to evaluate niche collaborations in biomass upcycling, soil stewardship, or mobile eco-sanitation, detailed in the next chapter (see 4.2). With the slowly growing cohort of fermentation-inclined individuals, and their organisational affiliations, it was possible to deploy vibrant proposals in text and event format to elicit potential institutional support. Convivial expressions of fermentation practices were proposed like ‘waste’-absorbing, soil-generating rooftop operations; memory-embedded biofilter ecologies; or monetizing wood ‘waste’ through biocharring. The proposals privileged inventive social participation above technology-centred solutions.

Some of these applied provotypes translated into actions and trial events like fermentive upskilling parties or mycelium-scavenging workshops, some ideas remained unrealised. Usually, insights were developed and unexpected outcomes emerged with event participants at the time of deployment. Unexpected for example was the strengthening of determination among cohort members in the face of resistance that many of the provotypes triggered. Another welcome side-effect was media attention the events had garnered which boosted group moral and generated credentials for funding applications. In response to the growing understanding of the situation, the responsive provotypes made virtuous use of uncertainty, and opened up conversations beyond the ideas and actions as Kristen Boehner et al (Boehner et al, 2012) indicate:

> They aim to open up possibilities, rather than converging toward singular truths, can be understood as part of a conversation among designers and the people and places for which they design (Boehner et al., 2012).

The provotyping process would start with some sort of ideation, then be enactivated in tangible form, to conclude in a reflective interpretation among cohort and participants in regard to the probe's value for deciding on the next steps. The early probes in this research, allowed to listen to concerns, and deriving ideas that then manifested as events. In effect, the provotypes produced a wealth of encounters and valuable pointers. One was that agriculture can be a very emotional topic even in Hong Kong, where it seem marginalised. Or, the practice of 'lazy farming' and composting methods that ease time pressure for busy urban rooftop farmers.

Within their infinitesimal scale, the provotypes promoted biomass cycling as collaborative craft, vehicles of purpose, and social engagement. While the probes were mostly ignored or rejected by established organisations, the response from participants was encouraging. They revealed the potential for event-based, craft-based probing in the group. The provotyping method can be a way to expand the influence of craftivism – beyond the confines of gallery and certain handmade genres – into a sphere of mobilised public-making[16]. And, last but not least, the provotypes indicated that human 'waste' can be a matter beyond public hygiene concerns. People do pay attention to what they bodily excretes and releases, certainly in regard to their own personal health—more so than for environmental reasons.

[16] **[unrealised idea]** ***Tasty Triage*** **– Food 'waste' emergency upgrade at the wet market:** The positive responses at fermentation events indicated the potential of pulling fermentation craft out of its homey confines of the kitchen into a public arena. This can attract people, expertise and enjoyment over handmaking and preserving food. One sample is an unrealised idea that ensued from discussions with community organisers. *Tasty Triage* was formulated for crafting unsold or leftover fruit and veggies at the wet market together with fermentation-savvy residents (amateurs and chefs alike) from diverse cultural backgrounds. The triage fermenters – as 'first responders' in averting food 'wastes' – would bring their native food preserving techniques to the table of the extravaganza and concoct leftovers into delectable foods. If spoiled, the residues would be composted into soil amendment. Using artisan preservation techniques from around the world like fermentation, pickling, candying and cold-smoking, these 'alimentary first responders' would recover nutritious abundance into yummy treats. This idea was contemplated as a contingency plan for realising the main study (in case human 'waste' proved too problematic to fit this into research).

3.3 · Integrative biopedagogies

As synergetic outcome of grounded theory, material performativity, and event-based provotypes, three essential insights were gained:

1. Human ‘waste’ can be intriguing as personal indicator of health states. In particular urine was promising in this respect due to its ease of handling and habitual use in medical diagnostics;
2. Humans like to live near or raise plants, especially in the urban context where they are cherished indoors; and,
3. Established organisations independent of societal sector seem understandably rather challenged with experimental collaborations.

In almost two years of provotyping, and inventive material performativity, no substantial collaboration with organisations in business or government, or education could be established. To get a participatory main study with human ‘waste’ off the ground in due time, it had to be confidently self-installed to ensure thematic and explorative integrity of the main study.

The primary ingredient in propagating lacto-fermenting bacteria, raising plants, and developing abilities in humans is the resource most contemporaries appear to lack: *Time*. The event-based provotypes indicated early on that asking for people’s efforts *over time* – on a deliberate, non-coercive basis – poses the number one challenge. Despite the nurture and enthusiasm that went into their realisation, the event-based provotypes were barely able to captivate participants beyond one hour or two. Yet, to ferment urine, and for possibly grow vegetal life out of it, a minimum of six weeks of active participation were called for. The key for engaging participants in the main study was located in the dynamic of persuasion and self-motivation. Urine as health indicator needed to engender a sense of urgency, and the nurturing for plant life needed to be rewarding. The methodical answer to this challenge was in *biopedagogic* mobilisation.

3.3.1 · Biopedagogic method and collaboration

The notion of *biopedagogies* (Halse, 2009) defines practices that are directing people in how they construct knowledge about their physical body. The concept scrutinises how media or education influences people in developing their self-understanding and their responses toward being what Christine Halse (ibid:54) calls a "healthy (virtuous) biocitizen". *Biopedagogies* stems from Michel Foucault's (1979) concept of "biopower"—the mode of operation exercised on life through practices that have direct repercussions on people's bodies. While *biopower* carries the strong notion of bodily life that is manipulated for the control of entire populations, *biopedagogies* are supposed to open up fresh ways of relating and responding to one's living organism by expanding experiences and insights. As outlined in the previous chapter (2.4.1), digital mediation is shaping *biopedagogic monitoring* by constructing novel meaning-making configurations of bodies, selves, and technologies (Lupton & Maslen, 2018). Partly due to its humbling technical limitations, as well as its fierce focus on the life-giving capacities of human 'waste', this study resorted to sensory, and non-digital (analogue) methods referred as *integrative biopedagogies*.

Integrative biopedagogies are methods to obtain knowledge about one's own condition from the biological relation of physical body with its living environment. In this scenario, the person initiates and conducts eco-environmental research with their own body as the catalyst, and daily life as the site for investigation and intervention. The aim of *integrative biopedagogies* then is to self-implicate participants into improving shared, interexistent wellbeing[17] for ultimatively provoke in individual and group adequate response and action. Wellbeing here entailed the *ability* to close the broken foodloop with adeptly upcycled urine; the *provocation* came from the environmental toxins that keep accumulating in our bodies (Liboiron & Dillon, 2013); and *adequate response* meant to change personal eating behaviours to generate more thriving and more palatable plants.

[17] **Integrative biopedagogy on citywide scale:** In his epochal socio-environmental work *7000 Oaks: City Afforestation Instead of City Administration*, Joseph Beuys has provoked an entire city and generations to come into a collective form of biopedagogy. In an ingenious provocation, Beuys deposited in 1982 inside the townsquare of Kassel 7000 basalt steles, that were human-sized, and weighted up to 100 kilograms. Beuys boldly requested to have the steles removed from the townsquare as individual and partial contributions, to be erected around town together with an oak sapling. Everybody knew it was ecologically sensible to double the city's tree population and in turn restrict urban development. Yet resistance was initially massive, and only Beuys' immense commitment gradually convinced individuals, schools, groups and the city council to take up the challenge. In the long run, the pile of basalt occupying town square was too oppressive and required collective action. As people planted trees over the years, they grew far beyond the steles and are invigorating to this day the cityscape of Kassel. Eventually the city government was entitled to reverse the meaning of the work's title to *City Administration Through City Afforestation* [Stadtverwaltung durch Stadtverwaldung] (Adamopoulos, 2015).

Integrative biopedagogy in this study was about opening abilities by providing skills and purpose, while pulling simultaneously something unsettling into the lives of people. This way they could be prompted to take a stand against their own incapacity and – with support of the group – define responses suitable to the larger context. Akin to the 'creative experiment' or the 'challenge' in Gestalt and Adventure education, provocation can create disequilibrium for mobilising intelligence and adaptive restructuring—with ample time and strategy, it even can lead to adept mobilisations on citywide level as seen in Joseph Beuys' *7000 Oaks* intervention (Adamopoulos, 2015).

3.3.2 · Organisation of main study

With time being the scarcest available ingredient in this research, the *biopedagogic mobilisation* had to be a short, stand-in version that eventually could inform an expanded future inquiry. This participatory, small-group study was meant as collaborative mobilisation for exploring what an intentional *biopedagocic peer community* (DuPuis, 2015) could feel like, how it could work, what its members would need, and what the outcomes could be. The primary purpose was to make one's own body and household, the origin of eco-existential abilities the where living properties of thriving – in bacterial cultures, plants, and household members – would become the currency in socionatural interactions. This way, larger-than-self environmental issues can be pulled tangibly into a socio-material conversation and potentially open up alternative perspectives. The abilities of participants were practically expanded with the provision of craft expertise, intricate props, analogue self-tracking instruments, and bolstered with social support in group activities and digital exchanges. While most of the *biopedagogic* activity took place at the home of the participants, the in-group sessions were conducted at the university. The technical details are explained in the next chapter (see ANTHROPONIX, 4.4.2). To meshwork the single households and sporadic group sessions into a socially cohesive method, the researcher and facilitators of the main study established a comprehensive engagement strategy primed from constant forging of working alliances.

Enrolling and committing adventurous participants: Two years of agroecological provotyping had resulted in a contact list of people and groups with an inclination for ecological concerns, urban farming, horticulture, local food and bioscience. This, together with an enticing *call-to-task* that combined horti-technical pioneering with biological self-empowerment (see 4.4.2), made urine recycling at home look like a convincing proposition. Precondition to be accepted to the application interview (intake) was the commitment to attend all five workshops over the six weeks to ensure full completion of the *biopedagogic* experiment. The actual number of applications submitted was above expectations, so the primary selection criteria was broadmindedness—the willingness to boldly enter unusual exchanges with body, plants and people. The participants' personal outlook on gardening, wholesome eating, and balanced living were considered secondary criteria.

Support system: The coordination of the study (which enrolled 22 participants) involved a team of four facilitators (made possible by two external grants) and consisted of the researcher, a product designer, communication expert, and a research assistant. The facilitators subjected themselves to the same procedures like any other participant. Such staffed allocation permitted to run contents-rich workshops, moderate the digital exchanges between them, respond in kind to individual needs, and go the extra mile when the situation demanded it. Also, the following measures of internal self-support were built into the tasks at home and workshops to help participants remaining in touch with developments in oneself and others alike.

Self-reflection and interaction triggers: To instil dialogue in participants with themselves and peers, specific tasks were assigned over the five-part workshops. Participants were asked to keep an intricate journal (see in appendix), conduct peer-to-peer surveys at the start of each workshop, bring back their living props for shared evaluation, and self-curate a photo presentation from their home adventures for group sharing. Details of these measures are detailed in chapters four and five.

Individual intake and exit Interviews: Each participant was interviewed at least twice, at the beginning, and end of the six-week study period. The original intent behind these semi-structured interviews was to evaluate the participant's experiential development in regard to the biological circulations taking place between body states, eating habits, plant

prosperity, and fellow humans. For the second interview, in addition to the standard set of questions, a personalised schedule was scripted for each individual, based on the person's responses in the first interview, and the observations made. With an open-ended schedule of questions, adjusted conversational interviewing was used since it is viewed as most effective for the grounded theory approach (Ralph et al, 2015). The schedule of topics for the comparative questions in both interviews were:

(1) Preferences in food, medications and bodycare;
(2) Concerns related to personal digestion and toilet routine;
(3) Affinities for microbial life; and
(4) Experiences with nurturing plants.

Upon completion of the six-week study period (and withstanding the humbling, technical breakdown), the additional schedule of topics of the exit interview included:

(a) Reasons and strategies for persevering in failure;
(b) Learning and takeaway from the study;
(c) Participation in the work group;
(c) Further reflections and outlook.

For contextualisation and triangulation with family members, it was attempted to conduct the exit interview at participants' homes to tangibly integrate the plants and props in the conversation. Eventually five out of 22 participants granted the researcher such a home visit. The interviewing was ethnographically guided (Sykes & Treleaven, 2009), where the researcher tries to approach each topic from the person's viewpoint from inward to outward – traversing impression, to reflection, onto expression – in order to explore multiple perspectives in the reality-making between individual and the world. Initially there is the concern the interviewee tells herself. Then this concern is put in relation to the situation and the interviewee is asked to formulate intentions. This combines how the interviewee feels about the situation and may put it up for consideration from the outside in alternative ways. In this uncovering of viewpoints, each question can therefore be further elaborated with follow-up questions and produce richer descriptions of concerns.

3.4 · Constant-comparative analysis

After the iterative journey of material performativity, provotyping, and biopedagogic preparations, the initial research intention was to bring participants into a consequential foodloop to evaluate if, and how it would influence individual lifestyle and demeanour. Originally, the analysis was set out to seek empirical evidence for how sensibilities and behaviour responses would change over time. This idealistic intention was obliterated when the technical set-up of the study vastly failed the participants in growing the plants meant to be living bio-indicators in interexistent flourishing. In this predicament the question arrived why participants remained deliberately committed to lengthy processes without much tangible results. Now the research intention changed and needed to centre on what had mattered most to participants when encountering obstacles. At this point the analysis of the study turned from horticultural ethnography into a grounded theory research. Instead of interpreting interexistent affinities, the data had to be scrutinised for participants' guiding concerns in adversity and turbulence. The researcher had to get comfortable with not knowing where the analytical iterations would lead and what the findings would be.

3.4.1 · Research journey

Grounded theory starts and ends with a topic. In this study it is the deep-seated human/nature disconnect that is detrimental to long-term thriving. It took three years of 'grounded mobilisation' – serial provotyping that was constantly reshaped by people's responses and referred back to theories – for finding out what can be most relevant to study participants. In the first two years, the research sought ways to make *value propositions* the driver of pro-environmental behaviour responses. This resonated well with literature on care and ethics. Yet, this also likely to make personal action dependent on manifested outcomes and precedents which are often measured on rigid standards—thereby neither really engaging on the endemic level, nor opening fundamentally new potentials. The participatory study aspired to make participants to co-researchers. They signed up for shared adventure and discovery, rather than a guaranteed outcome. It allowed for the research to penetrate deeper into the issues underlying the socionatural disconnects.

Upon completion of the participatory study, the initial ethnographic evaluation revealed how thriving in adversity is a matter of personal *attitude* where people self-define what aspects along the process are considered worthwhile learning or gratifying. This resonated with literature on social inclusion and equality (Verba et al, 1995). Such self-determination did not sufficiently explain what factors made people maintain attention and effort toward the group or their assignment. The question arose why some participants thrived better than others, and why some apparently were able to access social synergies, while others did not. This meant to scour literature in relational motivation and dive back into the data to look what the thriving participants had in common. After understanding the relationship between relational synergies and personal commitment, this research needed to inquire deeper into the dynamics behind *interexistent abilities* in people. Rather than contributing to ground-breaking theories, this analysis led to the uncovering of *grounded theoretical renderings* (see *adventure renderings* in chapter six) that can assist in understanding socio-dynamic concerns. For better context, an outline follows how the analysis was conducted.

3.4.2 · Design of analysis

The analysis stems from a multimethod and longitudinal study rooted in the grounded theory approach. Multimethod refers to the use of qualitative and quantitative data, collected from multiple methods and sources. The data derived from the self-documentation of participants (journal entries and photos), workshop interaction logs, facilitators' observations and field notes, digital text logs, and from qualitative, semi-structured interviewing. The longitudinal data generated from the interactions with 22 individuals over six weeks (or longer), allowed to draw both on the qualitative and quantitative paradigm. Grounded theory research is normally a five-stage process with sensitivity for theory, sampling, coding, memoing, and sorting. In this longitudinal study with emphasis on processual developments over time, the memoing and sorting has been consolidated into the fourth stage of *theory-based rendering*. The four stages were integrated applying the constant-comparative method where the researcher concurrently coded and analysed the data for gaining theoretical insight into the sociopsychological processes underpinning the experience of participants. Instead of deriving fixed categories, the aim of the research was to comprehend the participants guiding concerns deriving from the experience of the topic under investigation, like value creation, persevering in failure, and relational dispositions. Once these concerns emerged, the researcher developed theory-based renderings – models

of existential concerns in communal engagement – to clarify the dynamics of how participants reconciled their concerns before, during and after the study project.

3.4.3 · Sampling

Purposive sampling – collection of data that relates practice with theory – was the primary method used in this unrepresentative study. The sample was chosen to include participants that seemed most appropriate for the study in regards to available time, planting space, home environment, and personal interest. Since the main study was limited to one specific group, it can be considered a purposive case study (Tongco, 2007). The researcher conducted a total of 54 interviews which duration ranged from 45 minutes to three hours and on average was about one hour. Among the 22 participants, 19 persons were Hong Kong-born and three individuals where foreign-born. The participants consisted of equally 11 men and women, and the age range was between 22 to 58 years. The participants represented diverse socio-demographic and biographic backgrounds as indicated in the following listing (table 4).

(table 4) **Socio-demographic configuration of 22 study participants**

Enrolment	**Gender**	**Age Groups**	**Place of origin**	**Occupation**	**Household size**	**Housing type**
Study start: 22	Female: 11	20-35 years: 11	Hong Kong: 19	Students: 5	Single: 4	Flat: 20
Study end: 22	Male: 11	35-60 years: 11	Foreign: 3	Non-students: 17	Shared: 18	Detached: 2

The demographic profile of the 22 study participants in regard to housing characteristic with a dominance of shared flat dwelling is representative for Hong Kong

While the sample of participants was unrepresentatively small, the data generated from the six-week intensive collaboration was substantial. To utilise the material to the fullest, theoretical sampling was applied to the data for integration with and extension of theory. A principle in grounded theory is that *everything* is data, from the lengthiest interview, to observations, casual comments, personal biases, and whatever is substantiated along the course of research. In order to evaluate the existential concerns emerging in each participant, a comprehensive tracksheet was compiled (see excerpt in appendix). It chronicled all dialogues with peers and facilitators, including interview transcripts, response characteristics, and nonverbal communication from field notes and related data. Based on

the ongoing literature review, this data was correlated to affective states defined in Gestalt theory and their adaptive dimensions from humanist education.

3.4.4 · Coding and analytical renderings

The consolidated tracksheet contains a total of approximately 1000 phrases and sentences (referred to as *incidents* in grounded theory) which the researcher coded, using the constant-comparative method and line by line analysis. The coding was conducted entirely manually since Glaserian grounded theory is discouraging the use of any software (Glaser & Strauss, 1967). The coding allowed to start rendering the emergent concepts and their relationship. The prime focus of the analysis was to evaluate the participants' existential concerns in overcoming adversity and identifying the emergence of sociopsychological dynamics in person and group. As the researcher's sensitivity for sociopsychological theory deepened, consequent rounds of data analysis led to reconceptualization of categories and related properties.

As demanded by grounded theory, the researcher conceptualised directly from the data[18]. It meant that the data was analysed line by line while asking the following questions:

> The participant in this particular incident ...
> … is describing what?
> … is caring about what?
> … is worried about what?
> … attempts to do what?
> … is thinking and acting this way because of what?

The answers to these questions were examined against the emerging categories and corresponding properties from literature in relational motivation, self-determination, and experiential education research, using the constant-comparison approach. It meant that reviewing literature was a seamless continuation of the research process and neither preparatory nor separated thereof. In this sense, grounded theory necessitated a continuous literature *analysis* rather than a traditional literature review.

[18] **Description of data versus conceptualisation *from* data:** Traditional qualitative methods are generating insight based on thick and rich interpretations of data and participants' statements which has been applied to chronicle the main study ethnographically in chapter five. In grounded theory, conceptualisation *from* data means that the researcher is seeking patterns and their notions about place, time and relationships by applying the constant-comparative method as a developmental tool for formulating emergent concepts.

The constant-comparative analysis between participants' existential concerns and relevant literature was captured in three sequential rounds of visualising, theory-based renderings. In the first rendition the existential concerns were captured in relation to events and group response which led to the categorisation of four types of passages (*integrative autonomy* chord, see 6.3.1). Then in the second rendition, these typified passages of all participants were assembled onto one timeline (see 6.3.2) to identify correlations with group dynamics. This helped identify the core existential concerns which endorse thriving in adversity – concerns that can expand abilities in person and group – which prompted the third rendition of the model for existential motility (*adventure renderings* as communal engagement model, see 6.4.1). These grounded renderings achieve workability when they help visualise the emerging concepts and processes. Ideally the grounded renderings explored in chapter six, would be able to explain, predict and interpret what is occurring in the formal inquiry of an ongoing collaborative setting. Yet, to test this workability, much larger samples in consequent, and more targeted studies would be necessary that were beyond the scope of this research.

3.4.5 · Limitations

Tackling the tabooed issue of human 'waste', exploring collaborative opportunities, adhering to biological growing cycles, attending to the concerns of participants, working in a dense urban environment, and inexperience of the researcher, prompted a plethora of limitations.

Sample size: 22 participants and 13 short-lived interventions (event-based provotypes) cannot be representative of the population or situation. While the data and insights do not have statistical relevance or transferability, in the context of small-group collaboration and failure-friendly learning, the research can contribute indicators and visualisation approaches as well as pointing to future research opportunities.

Measures used for data collection: As part of the findings, the existential concerns and the theoretical framework of relational motivation has emerged without the possibility to include specified measures (instruments) and conduct a follow-up round of data collection. Since multiple datasets for each participant from multiple sources (complementary statements from facilitator team, peer references, participant's family) provided ample triangulation, this lack is not invalidating the findings. In retrospect, such measures can

deepen the analysis, and hence there is a need for future research to revise the respective method for data collection.

Self-reported data: Despite utmost consideration for data collection and triangulation – integrating peers, family members, or longitudinal observation – self-reported data can rarely be independently verified. There may be certain biases like exaggeration by representing personal efforts as more significant than is suggested by other data. The effects of this limitation were mitigated by accounting for the substantiated efforts from participants' journal keeping, props appropriation, and their physical presence during the extended contact time (workshops and interviews) into the interpretative analysis.

Technical malfunctioning: The inferior horticultural set-up of the main study prevented participants from succeeding operationally which brought about a highly uncertain research trajectory. The precarious technical means was compensated with organisational buffering, generous staff allocation, and dedicated participant guidance.

Language fluency: While most participants were fluent in English, the researcher who is a non-Cantonese speaker, relied in the case of three participants on third-party interpretation and was not able address them in their primary language.

The next chapter illustrates in detail how the 'grounded mobilisation' approach was implemented in the real world through the formulation of provotyping, eventing, and integrating biopedagogies, and the resulting outcomes over the course of three years.

1

Upcrafting Ventures

This chapter chronicles the 13 collaborative field experiments that constitute the applied work of this inquiry and helped formulate the participatory study. During the first 20 months of the study (May 2015 to January 2017), these event-based provotypes – practical change experiments introduced in previous chapter – in various social contexts were conducted to evaluate applications, methods, and techniques for the sensible use of human 'waste' in Hong Kong. The purpose of these fermention-based, social experiments (agroecological explorations) was to inform the main participatory study in three ways:

- **Find practical application** of human 'waste' that lend directivity and purpose to the main study by emphasising its regenerative, biological value;
- **Build network of support** among inclined individuals, scientists, business, educators and farmers for advise, advocacy and active participation;
- **Localise and contemporise** fermentation- and biochar-based conversion of organic byproducts in the agriecological context of Hong Kong.

The event-based provotyping introduced as method brought Upcrafting Ventures into existence. This neologism stems from the concept of *upcycling* and is understood as a dynamic coordination of upskilling efforts aimed at contributing to ecological economies and long-term flourishing. *Upcrafting* approaches the upgrading of byproducts as opportunity to expand the human body in adept ways into flourishing interactions with the world.
Built on courage and a desire to learn, *ventures* are adventurous missions with potential for the unpredictable and failure.

The Upcrafting Ventures were part of an interventionist reconnaissance to broadly explore the field of possibilities across different lenses, identify limitations, and eventually find focus. To gain access to different societal sectors, a number of different platforms were collaborated with for staging explorative Upcrafting Ventures. The following listing (table 5) provides an overview of methods, and platforms in relation to formulating the research questions and emerging outcomes.

(table 5) **Field experiments of Upcrafting Ventures (provotypes) leading up to main study**

Platform	Date	Interventions	Methods and format	Dissemination	Learning Phase
4.1 Artful stagings with acceptance concern					
*) Research Institute of Organic Treasures R.I.O.T.	March 2015 to Dec 2016 (4.1.1)	**The Zero Organic 'Waste' Home**	Endurance performance and socio-biological 'wet lab'	Press reporting	What kind of educational performances with biochar-based composting of organic 'wastes' can find acceptance?
SoIL 鄉土學社 (Society for Indigenous Learning)	3 May 2015 (4.1.2)	**Soil Cooking**	Communal fermentation and compost demo	n/a	
Jeju Art Centre	Aug 2015 (4.1.3)	**Fermenting Jeju**	Participatory metabolism installation	n/a	
Ng Tung River Art Festival	Dec 2015 (4.1.4)	**Make friends with Lactos!**	Fermentation workshop/demo	n/a	
4.2 Civic proposals with outreach concern					
Legislative Council's Panel on Food Safety and Environmental Hygiene	9 June 2015 (4.2.1)	**Biochar production in the New AgriPark**	Contribution to public hearing	Proposal	How can biochar-based composting and soil stewardship find public support?
Environment and Conservation Fund 環境及自然保育基金	July 2015 (4.2.2)	**Biochar-based Terra Preta technology demonstration**	Science collaboration	Proposal (not submitted)	
Hao Ran Foundatation 浩然資助計畫	Sept 2015 (4.2.3)	**The Compost Alliance** (城市在發酵)	Community demo	Proposal	
4.3 Speculative collaborations with productivity concern					
) Research Institute of Organic Treasures R.I.O.T.	July 2015 (4.3.1)	**Biochar from spent grain at HK Beer Co.**	Entrepreneurial pitch	Proposal	How can biochar-based upcycling of organic 'wastes' become the foundation of a social enterprise or startup?
Green Building Pitch	5 Sept 2015 (4.3.2)	**Black Circle** (雲土間)	Eco-business campaigning	Promo trailer	
) Research Institute of Organic Treasures R.I.O.T.	26 Sept 2015 (4.3.3)	**Full Moon Char Soirée**	Educational rooftop event and party		
Hong Kong University General Education Unit	Feb 2016 (4.3.4)	**Turning 'Waste' into Gold**: **Generate Indigenous Bokashi**	Bokashi indigenous compost course	Design article	
4.4 In-group mobilisation with practicability concern					
Korean Research Institute of Chemical Technology	Jan to May 2017 (4.4.1)	**Aquaforming Mars!** (아쿠아포밍 마즈!)	Art installation with urine collection and testing trial	Catalogue	How can fermenting and applying urine for water-based plant growing become desirable and workable for the individual?
) Harboring Organisms, Sharing Tensions H.O.S.T.	April to May 2017 (4.4.2)	**ANTHROPONIX** (人類水培) (formerly 'Golden Growing')	*Integrative biopedagogies* with consequential food loop	Video doc Science article Book chapter	

*) independent and self-instigated platforms

Research experimentations over 20 months with platforms, methods, dissemination and research questions.

In the two years leading up to the Upcrafting Ventures in Hong Kong, the researcher was already converting his own human 'waste' in a hygienically safe, self-controlled manner to yield valuable fertiliser. As outlined in chapter one, recent agroecological research (like climate farming) integrates soil science, anthropology and sanitation from pre-Columbian techniques of Black Soils (Terra Preta Sanitation) cultivation that allow a sensible reintegration of organic residues into humus-building, healthful food production, *and* climate buffering (Schmidt, 2012). In close collaboration with Terra Preta experts and ecologists, the researcher conducted personally a practical foodloop trial, where over one year all excrements were collected, fermented, and composted into organic fertiliser with the addition of plant-based, high-temperature charcoal (biochar).

This preliminary upcrafting trial was developed over two years between 2013-14. The processing took place at the on-campus organic garden of the Australian National University in Canberra and yielded spinach, and radishes for self-consumption as well as a video titled *Soil Feeder: Fermenting My Everyday* that documented the entire process[19]. Terra Preta Sanitation was chosen as technique for bioconversion, because it is already successfully implemented in contemporary urban contexts in the Global North (details in footnotes of chapter one). This fermentation-based cultivation method is adaptable to local conditions, scalable to local condition, and can invigorate local biodiversity and food systems (Schuetze et al, 2014).

[19] The four-minute long video about a closed personal foodloop titled *Soil Feeder* is viewable on Vimeo: https://vimeo.com/111683541

4.1 · Artful stagings with acceptance concern

The first phase of field experiments emerged from personal contacts and initial conversations with farming activists, and educational gardeners in Hong Kong. These probing ventures were meant to test out methods for making biological interactions with organic residues approachable to interested urban audiences. This orientation phase was foremost concerned with developing sensibilities toward visceral material engagement and experimenting with bio-cultivation techniques. Yet these preliminary activities were also about forging connections with likeminded individuals or organisations. These initial relationships would become foundational for carrying forward the explorative study.

4.1.1 · The Zero Organic 'Waste' Home

The Upcrafting Ventures were conducted without any real precedent. Aside from one noteworthy exception (noted below) it is not common for people in Hong Kong to recover human 'waste' for agroecological use at their homes. Working outside of what is considered normalcy, it was necessary to establish an independent platform, and to lead by sample. Adopting the personal foodloop cultivation technique acquired in Australia, the researcher tested out the practicalities of Terra Preta Sanitation for a two-person household in urban Hong Kong in Tai Po Market (大埔虛). In this informal, real-life 'demo lab for agroecological homemaking', all organic residues, including human 'waste', were collected in the bathroom of a seven-story high apartment building and processed one floor above on the rooftop into veritable soil. The goal of this exercise was to prove that it is possible (with ample dedication) to sensibly reuse – on the residential premises – all organic residues from kitchens and human bodies without disturbing public order. The guiding principle in this radical agroecological regime was to *upcycle 'waste' with 'waste'*—refrain from spending any pristine resources when treating 'waste'. Using bacteria power, rain-water harvesting, recycling discarded utensils, and befriending sanitation workers, it was possible to build and run the composting operation completely off-the-grid. All organic inputs for balanced soil production were salvaged locally, including rice bran, coconut husks, sawdust, bamboo rhizome, spent sugar cane, soybean residue and dried banana flowers. Experimenting with recycled oil barrels, steel canisters and washing machine drums, low-tech rocket stoves as shown in the following photograph (figure 8) were established to produce biochar from

woody residues like rice husks. Biochar is essential for long-term nutrients and moisture retention in the soil.

(figure 8) **Biochar firing on urban composting rooftop as social gathering**

Wanho Tam (very bottom-right) and the researcher testing out their first rocket stove at the Tai Po Market rooftop to convert woody 'wastes' into valuable biochar in April 2015.

The Zero Organic 'Waste' Home was not the only household at the time in urban Hong Kong, where human 'waste' was agroecologically reinvested. For several years until 2016, a 'homeless' guerrilla farmer by the name of Mango King (芒果王) occupied and cultivated crops in the urban no-mans' land, beneath a highway crossing in Kowloon (Leung, 2017:11-17). Using a traditional technique, the guerrilla farmer added weeds and straw to accelerate the spontaneous fermentation of his source-separated urine and excrement. Farming about 6,000 square feet (560 square metres) with 40 papaya trees and a large variety of crops, Mango King needed to harness all available nutrients his body released to fertilise the remnant strip of public land. The use of urine for fertilisation in activist farming activities in Hong Kong is not uncommon, as seen in the 'Farms for Democracy' inside the government district during the Umbrella Movement in 2014. In distinction, Mango King's human 'waste' upcrafting was an integrated part of his daily bathroom routine, next to the tent he was inhabiting. In social terms, Mango King was considered a homeless farmer, yet agroecologically he has set the precedent for the truly adventurous homemaker is. He ran a tidy, welcoming urban homestead, brought barren ground to fruition as shown in the following photograph (figure 9), and supplied a local restaurant in Yau Ma Tei with tasty produce (ibid). This is the creation of a crop value chain from the underutilised in the given situation.

(figure 9) **Guerilla homemaking: The agroecology of a homeless farmer in Kowloon**

Mango King mastered and practised the art of anthropogenic fertilisation on public urban land in Yau Ma Tei until 2016, using his own human 'waste' (photo curtesy Michael Leung).

Like Mango King's homeless homestead, the Zero Organic 'Waste' Home's existence depended on social interactions. One month into the rooftop homesteadying, Wanho Tam, a carpenter and permaculture practitioner who lived in the neighbourhood joined the project which led to the collaborative initiative named Research Institute for Organic Treasures (R.I.O.T.). Through personal networking, the small agroecological demo lab in Tai Po Market became a gathering place for garbage-inclined scholars, anthropologists, makers, journalists and elementary students. In particular the nightly firings of the rocket stoves (for 'pressure-cooking' woody residues into biochar) always attracted visitors. The rocket stoves contained airtight metal containers ('retorts') where with elevated temperatures (above 500° Celsius) in absence of air, woody residues would carbonise ('pyrolysise') into non-decomposable, stable carbon structures called *biochar* that is conducive to soil stewardship (see footnotes in chapter one). Slowly the Research Institute for Organic Treasures built up a fluid and small following of a dozen young people who interested in wood-crafting, biochar science, applied climate farming, and rooftop partying.

Over the 20 months of its operation, the Zero Organic 'Waste' Home was possibly non-compliant with certain sanitary regulations, yet it produced tangible agroecological results. Wanho Tam designed and custom-built a urine-diverting, collection toilet that incorporated recycled 4-liter water jugs which allowed large quantities of urine to be fermented. The wood frame of the toilet fixture had a compact footprint and was waterproof to withstand

splash and flood waters in combined shower/toilet rooms in space-deprived Hong Kong flats (details in next chapter, 5.2.2). Henceforth, urine and faeces from researchers and visitors were recovered separately at the Zero Organic 'Waste' Home and produced Terra Preta Black Soils.

For smell-free processing of urine, an organic buffer was created by first carbonating (pyrolising) about 200 liters of dried rice husks (from the local Nam Cheung farm) and pure sawdust (from the nearby carpentry school). The resulting 50 liters of biochar were mixed into 350 liters of spent sugarcane shreds (from the teashop downstairs) with traces of forest soil for microbial incubation. In this biochar-sugarcane bedding a total of 750 liters of fermented urine (stabilised with sauerkraut juice) was added which – over three months of bacterial conversions – resulted in fine humus.

For processing faeces, the buffer medium of choice was self-made bokashi which permits the in-vessel collection of greasy putrescibles including human 'waste' by minimising odours and excess moisture. The highly absorptive bokashi bedding was sourced from 200 liters of rice bran (milling residue from local rice mills) and inoculated it with traces of bamboo rhizome (from the local park). This do-it-together, indigenous bokashi was able to preprocess and ferment the 100 liters of kitchen 'waste' together with 75 liters of faeces deposited at the Zero Organic 'Waste' Home toilet. The making of indigenous bokashi is further explained toward the end of this chapter (see 4.3.4). In the conversion processes of fermentation, composting and evaporation, a lot of moisture is set free which reduces the volume of the organic residues and yielded about 500 liters of Black Soils. The following compilation (table 6) groups the quantities of organic inputs in relation to the two separated streams of urine and faeces recovery.

(table 6) **The Zero Organic 'Waste' Home in numbers:** **Total quantities of processed organic residues during 20 months**						
	Rice husks (hulls) and sawdust	Biochar (buffer)	Sugarcane shreds, ash, forest soil	**Urine** (diverted)	Humus	
URINE Recovery Stream	200 L	50 L	350 L	**700 L**	300 L	
>	>	>	>	>	>	**500 L** Soil yield
	Rice bran, inoculant	Bokashi (probiotic bedding)	Kitchen scraps, food 'waste'	**Faeces** (diverted)	Humus (from above), leaves, twigs	
FAECES Recovery Stream	200 L	200 L	100 L	**70 L**	450 L	
Urine and faeces from the researcher and guests of the were Zero Organic 'Waste' Home were collected and treated separately with buffer medium and probiotic bedding through Terra Preta Sanitation adapted to Hong Kong conditions.						

A couple of visitors donated their 'agroecological treasures' at the Zero Organic 'Waste' Home toilet. Unsurprisingly, nobody (except for one) was willing to dedicate themselves to ferment-processing excrements and set up their own Terra Preta compost toilet. Many visitors mentioned upfront, they may be inclined to compost their food 'waste', but had neither access to a garden, nor land for utilisation. The agroecological bucket toilet was perceived as something that belongs to a lesser privileged area of the world but not to the home of a top-tier metropolitan city. The response from academic rooftop visitors varied depending on their background. Researchers from the humanities could appreciate the discard-related social engagement of the experiment, while people with engineering and science background wondered about scaling, quality monitoring and efficacy. There was one exception to the overall *not-in-my-backyard* responses. The Zero Organic 'Waste' Home evidently resonated well with a garbage reduction activist. Two years after the demo lab had closed, the researcher was invited to the activist's house and astonished to find a fully functional and fermenting replication of the Zero Organic 'Waste' Home, including a biochar rocket stove documented in the following photographs (figure 10). The activist proudly declared how her self-implemented Terra Preta Sanitation is a very concrete step to personally reduce her carbon footprint, every time she and her partner use the toilet.

(figure 10) **One case of adopted Zero Organic 'Waste' Homemaking**

Self-documentation of garbage reduction activist in Sheng Shui who adopted Terra Preta Sanitation to curb her personal carbon footprint: Storage of monthly batch of urine at her home (left) and self-build rocket stove for biochar production in her front yard (photos courtesy the garbage reduction activist, 2017).

Over the 20 months, the Terra Preta bioprocessing was optimised for the subtropical, conditions of Tai Po Market. Integrating the fermenting of human 'waste' into a busy lifestyle, required effective ways of regenerating bacterial starter cultures (inoculate). Discussions with biologist Sophia Wunderlich led to serial trials of propagating sauerkraut juice (lactic acid bacteria) with plain soymilk. The resulting formula regenerates the bacterial stem culture in a self-sufficient, low-cost way, reducing the need for laborious sauerkraut production.

The demo lab also maintained a worm farm, three compost bays and planters built from disassembled wood of shipping pallets to produce wholesome soils. In the bacteria-friendly climate of Hong Kong, fermentive protocols were established and after six months the first batch of homemade, anthropogenic soil was used to grow decorative plants on the rooftop.

4.1.2 · Soil Cooking

The educational farm SoIL (鄉土學社), the Society for Indigenous Learning in Sheung Shui, invited the Zero Organic 'Waste' Home to provide a compost workshop on Earth Day in 2015, coinciding with the United Nation's International Year of Soils. With this study just breaking ground and in search of likeminded collaborators, this workshop proved to be vital to kick-off networking efforts. To complement the lectures of other soil-related guest speakers, the SoIL (鄉土學社) organisers asked for a fun and engaging half-hour long

presentation. In response, Wanho Tam and the researcher presented *Soil Cooking*, by demonstrating the visceral steps of a circular Terra Preta foodloop within a 30-minute performance as shown in the next photograph (figure 11). It was the live enactment of the *Soil Feeder* video, involving small compost specimen of all processing stages, decorative arrangement and entertaining commentary.

The Earth Day event attracted about three dozen people with a shared interest related to wholesome, local food production. Most were experienced permaculture practitioners, gardeners, farmers, educators and even arborists. Many contacts made during this Sunday afternoon would eventually lead to other Upcrafting Ventures, and some would join as participants in the main study two years later. Several people (including the Terra Preta-adopting garbage activist encountered in previous section), saw in the demo the possibilities of reusing organic 'waste' and address overflowing landfills. Some wondered if expired milk powder was suitable for urine-fermenting bacteria cultivation, or coffee ground appropriate in bokashi composting.

(figure 11) **Culinary performance with organic residues**

All compost inputs were miniaturised so they could be presented in one, materialising sequence on one table.

Standing out from a typical soil lecture, the Terra Preta composting process was distilled into a cooking show. Since composting is not delightful as a one-person show, Wanho Tam and the researcher acted as culinary hosts to engage members of the audience as the cooks. Bucket toilet, ferment containers, and compost bins were all miniaturised to fit onto a carry-on cart. Except for the raw input materials, samples of all fermentive process stages were put on display, including the resulting Black Soil. The commentary and audience interactions were strictly kept in the style of a cooking show providing food for soils and thought.

4.1.3 · Fermenting Jeju

The concept of the Soil Kitchen could be deepened in the more reclusive sphere of the artworld, when curator Yongsun Park from ArtScenic culture centre in Jeju, invited the researcher and Wanho Tam to a one-month research residency. The main objective was to learn from fermentation techniques and compost toilet traditions on the Korean island and consolidate expertise for the Zero Organic 'Waste' Home. The residency concluded in a public installation to present the findings.

In a kind of fermentation crusade, alternative ways of fermenting urine were sought that went beyond sauerkraut juice. The residue brine from *spoiled* kimchi, was found to be very potent as lactic acid bacteria starter culture. Also, cultures that stemmed from sourdough of ground soybeans, rice wash residue, and discarded makeoli rice wine. Besides bacterial discoveries, the rural island also featured landmarks of *metabolic architecture* with Jeju's traditional pig-latrine – dottongsi (돗통시) – which was conceptually adopted for the public art installation as shown in the next photograph (figure 12). *Dottongsi* were part of a resource-integrating, agroecological system where human 'waste' was feeding pigs along with food scraps—the resulting manure was mixed with barley to ferment into cherished fertiliser (Salmon, 2007). *Dottongsi* were clean toilets that offered both privacy and a view around the landscape.

(figure 12) **Referencing a foregone agroecological architecture**

Research collaborator Wanho Tam sitting on 'metabolic architectural structures': The traditional dottongsi (돗통시) *pig-latrine of Jeju island in Korea reinterpreted in the gallery of ArtScenic in August 2015.*

During the residency, encounters with locavore and permaculture teachers Uni Park, Sara Lee and Erik Sweet, led to shared fermentation research and collaborating on biochar making and dry toilet improvements at a permaculture residence in Sangbonsan. The learning of this journey was made into a participatory installation at the Jeju Art Centre under the title Fermenting Jeju as depicted in the following photograph (figure 13). In the ongoing discussion with these permaculturists, the sentiment was shared to potentially apply fermented urine in water-based (hydroponic) planting for replacing chemical fertilisers, thereby making soil-free horticulture more renewable. This inkling would foreshadow the set-up for the final study.

(figure 13) **Fermentative-metabolist assembly line in the gallery**

Participatory Fermenting Jeju installation where visitors worked their way through the basic steps of kimchi making which also accounted for composting food and human 'wastes': the minimal admission to the exhibition was donating finger nails and hair clippings as the biological entry ticket—the agroecological admission.

At the Fermenting Jeju installation, visitors were greeted by ushers wearing aprons with the message 'Let Us Ferment You!'. Then they would be guided into a maze-like circuit walk inside the underground gallery space to partake in bodily ways in the metabolic installation. It was an attempt to bring the audience during the opening temporarily into a shared gesture of resource-integrating cultivation. Along a long table, visitors were asked to work their way through the basic steps of making kimichi where all residues were accounted for as well: vegetable scraps went to compost and rice husks were carbonised in a miniature rocket stove. These residues then could be used at the back side of the gallery where a contemporised version of the *dottongsi* (돗통시) dry toilet overlooked the entire space—providing the evacuating visitor both privacy and view over the entire gallery space. The agroecological concepts underpinning the fermentation techniques were narrated on the

wall in writing around the gallery. Since not many dared to use the contemporised *dottongsi*, visitors were required to donate hair and nail clippings to the compost as admission to refreshments at the buffet. While the dry toilets were only minimally used, valuable feedback was given to refine the ergonomics of the toilet fixture for potential later use.

4.1.4 · Make Friends with Lactos!

The Ng Tung River Art Festival (梧桐河藝術節) was an outdoor event promoting 'low-carbon' and healthy lifestyle with craft workshops and music performances organised by Make a Difference (MaD), a local changemaker initiative. After acquiring kimchi making skills in Korea, the researcher and Wanho Tam were invited to conduct several fermentation and Terra Preta composting workshops in Hong Kong. 'Lactos' was the nickname for lactic acid bacteria (lactobacilli) to acknowledge their beneficial roles inside and outside of human digestive ecosystems (as in gut and yoghurt). Similar to the Fermenting Jeju installation, where the 'Lactos' character was first introduced, the personified bacteria helped narrate agroecological concepts in participatory workshops. Make Friend with Lactos! (乳酸友仔 Lactos 開始報名啦!) was an antitode to widespread fear of microorganisms addressed in the workshop invitation:

> By befriending and working together with Lactos, we become 'multispecies chefs'. We are not only cooking probiotic nourishment for humans, but also feeding back the vital energy and resources to the web of life that we totally depend on [from event announcement on Facebook].

Workshop participants not only made their own sauerkraut as documented in the next photograph (figure 14)—they also learnt to use it in a complementary meal since it is not part of the local cuisine. Participants were also invited to bring dried fruit pits, peels and leaves for carbonising them in the mobile rocket stove into decorative and durable biocharred artefacts. Plus, if they were so inclined, a dry toilet was in service too.

(figure 14) **Fermentive agitation during the 'make-me-feel-greener' workshop**

Participants of the Make Friends with Lactos! workshop chopping and mushing the very first sauerkraut of their lives.

For time-pressed urban dwellers, an afternoon outing in the outskirts of the city for reconnecting with handmade food culture and likeminded group was likely a welcome diversion. Such 'green' lifestyle workshops are popular. They provide a social experience, glimpses into life alternatives, and access to folk wisdom—without committing to any personal change. Participants were eager to witness the processing from raw produce to food preserve, or from 'waste' to soil. Yet, when asked to apply the newly acquired fermentation skills at home, most declared that while enjoying the temporary doing, the actual integration appeared too troublesome due to lack of time, space, or necessity. The perceived barriers seemed not worth the elusive rewards. Without access to a balcony, yard and nearby collaborators, nobody can expect people to reorganise routines and life arrangements. The impact of such 'biophilic' workshops then will cease on the way home. 'Green' lifestyle workshops can engender something like the "cooking show syndrome" as Michael Pollan (2013): scarce spare time is spent watching the increasing number of televised chefs performing their tasty craft, rather than preparing food themselves. This rings true for 'green' workshops as well.

Contrary to TV shows, the fermentive upskilling of Make Friends with Lactos! were kept engaging and demanding for participants—while they lasted. Keeping lecturing to a minimum, involving participants in all preparations, alternating hands-on experiences with concept explanations, and making all stages of bacterial transformation available to the sensorial experience. If a participant would decide (against the odds) to apply the newly acquired expertise at home, the participant could replicate it with more confidence. For the

more likely case the new expertise was never accessed, in the least participant brought home a jar of self-made sauerkraut, kimichi or self-carbonised charred artefact.

4.2 · Civic proposals with outreach concern

The first phase of field experiments established how engaging with putrescible materiality, including human 'waste' – granted it is a clean and delightful experience – attracts a temporary audience at the researcher's home, the farming workshop or in the gallery. This makes for enjoyable diversions but little changes in daily practice. Therefore the second phase of interventions sought potential opportunities in the public arena.

4.2.1 · Biochar Production in the New AgriPark?

It is understandable that human 'waste' would find more acceptance at a 'low-carbon' river art festival than in governmental policy making. Getting involved with Hong Kong's Legislative Council's Panel on Food Safety and Environmental Hygiene in spring 2015 was a spontaneous exploration on the sidelines with little effort required. At the onset of this study, the Hong Kong government invited advice for a public consultation hearing on its proposed New Agriculture Policy.

Noteworthy to a number of farming-concerned citizens (Zimmerman, 2015) was how this initiative for the "Sustainable Agricultural Development in Hong Kong" (2014) was proposed to focus on one centralised technology park (AgriPark) and industrialised, high-efficiency solutions for boosting food production in Hong Kong. The integration of smallholder farming and its importance in urban ecosystem services seemed missing in the policy draft (ibid). Sensible urban agriculture is not just about food yields but integrates biomass reuse, carbon trapping, soil stewardship, and has a wideranging social dimension. In cooperation with the study's scientific co-supervisor Henry Po-Heng Lee, the researcher prepared a commentary (see appendix) for the public consultation to account for regenerative biomass circulations inside and outside the AgriPark with a long-term cultivation approach combining fermentation, composting and biochar carbonation as indicated above (4.1.1). Such a strategy would also allow to integrate a Terra Preta Sanitation system for the guest hotel

that was planned inside the AgriPark, akin to the agroecological toilets at the Botanical Garden in Berlin (detailed in chapter one).

Promoting the reuse of human 'waste' – as well as other organic residues – can never be a means in itself. Akin to the *dottongsi* (돗통시) Korean pigsty latrine (4.1.3), in agroecological systems, human 'waste' becomes simply part of a continuous agroecological value chain creation though implementing buffered, organic fertilisation. High-temperature biochar from woody residues provides a dynamic buffer to mitigate microorganisms, moisture, nutrients and carbons (Lehmann, 2007). Therefore an energy-efficient pyrogenic biochar reactor facility was proposed that supports local farmers and foresters in converting woody byproducts into long-lasting bio-buffer that vitalises soils, water cycle and sequesters carbon.

Preliminary exchanges with farmers and other commenters at the public consultation helped strengthen people relations essential in this study. In the waiting room of the Legislative Council, the researcher encountered the Director of Kadoorie Farm and Botanical Garden (centre for biodiversity conservation and environmental education) and District Councillor and social innovation designer Paul Zimmerman who brought insight and referrals to the study's exploration. As expected, the submitted commentary had no influence on the AgriPark and policy implemented. Still, the surrounding discussions indicated how agriculture is an emotional topic since it touches on the biophysical foundation of society.

4.2.2 · Technology demo for biochar composting?

Another sideline exploration early in the study was the preparation of a technology demonstration for the government. During the Soil Cooking workshop (4.1.2), the researcher was introduced to Alvin Tang, an ecologist specialised in mycology and tree management, who also committed to measures of waste reduction. He was sympathetic to applied Terra Preta research and suggested to formulate a joint technical demonstration in response to bursting landfills and unaccounted greenhouse gas emissions from organic 'wastes'. The intention was to apply for the prestigious Environment and Conservation Fund (環境及自然保育基金) with a food 'waste' processing trial in two hundred residential households utilising the Terra Preta cultivation technique. The scientifically guided composting trial was to

provide a procedural precedent for the application of biochar in a community-supported 'waste' recovery project.

In the writing process of the joint technical proposal, Alvin Tang's insights on Hong Kong's illustrious composting history and regulations, proved invaluable and discovery in itself. The preliminary research for justifying the Terra Preta demonstration put more light on restrictive sanitary ordinance and challenges of previous municipally sponsored compost trials. Short-termism, or technical overreliance appeared as restricting factors of earlier composting trials.

In the course of proposal writing, the researcher had to realise how *technical* demonstration was geared to deliver a comprehensive food 'waste' management system that is highly effective, readily scalable, and matches convenience standards with the least possible involvement of person and community. The more automatized this Terra Preta Sanitation system was, the higher the chances for funding were. The proposal seemed like an engineering task for standardising an ancient cultivation technique. Certainly there was no tolerance for integrating human 'waste'. In the end the researcher missed the deadline and the proposal was never submitted. The question now was if there could be alternatives to such technology-centred approaches. Was there legitimacy for a more socially powered biomass cultivation that could evolve from the bottom up based on improving social arrangements?

4.2.3 · The Compost Alliance (城市在發酵)?

It was increasingly intriguing to contemplate how shared, communal and educational efforts could set precedents of change and influence long-term agroecological flourishing. Instead of agronomic infrastructuring, the question was whether bundling *existing* agroecological micro-practices could help ease the pressure on landfills, emissions, and food security. In a vertically oriented city, there is social potential on vacant rooftops if repurposed as conversion hotspots for biomass reintegration. The Zero Organic 'Waste' Home (4.1.1) could be seen as baby step in this direction. In collaboration with the broad spectrum of gardeners – from leisurely plant lovers to commercial growers – the agroecological potential could extrapolate from one rooftop to another. Empowered to upcycle organic residues discarded

nearby into veritable soil, urban gardeners' dependency on imported humus would be reduced and material circulations closed as the next flow chart shows (figure 15).
Such reallocation of social space and commitment is unchartered territory a funded pilot project was called for to gather expertise among rooftop gardeners and organisational backing.

(figure 15) **Charting of a community-led biomass reintegration**

The Compost Alliance was an attempt to reconnect the social dots in a world of linear and broken material cycles.

Over a several months, a dozen urban garden projects in Kowloon and on Hong Kong Island were approached to discuss the idea of a coordinated rooftop composting initiative.
This Compost Alliance was conceived to offer rooftop gardens, neighbouring homes, and offices ways of recycling organic residues in localised humus-generating exchanges. With proper procedures in place, kitchen scraps and food 'waste' convert in due time into humus for pots, planters, parks, or even retail. Compost Alliance was a preliminary instigation into rooftops as places for fermenting biomass and fomenting neighbours. Five rooftop garden groups joint the Compost Alliance proposal (Very MK, Rooftop Republic, The Impossible Farm, Yaumatei Gardeners, Zero Organic 'Waste' Home). Institutional endorsement was granted from the Society of Indigenous Learning SoIL (鄉土學社) which made it possible to apply for the Hao Ran Global Partnership Grant (浩然資助計畫) in Taiwan sponsoring cultural and ecological initiatives in Hong Kong.

The idea was to make urban resource management a grassroots effort by involving the urban garden partners and local households in planning, and implementation. As seen in the theories from humanist education (2.1.2), social buffers that provide restructuring and

support are essential for people to adapt behaviour responses. Each of the six associated urban gardens was to establish a Fermenting Station on their premises facilitated a group of trained Terra Preta mentors who would support up to ten compost-practising families. Collectively all members of a Fermenting Station would have been responsible for the periodic generation of fermentation cultures. On-site rocket stove (biochar), bokashi repository, compost bays and Terra Preta dry toilet would have composting neighbours allowed to take turns in the selforganised compost processing, the Compost Alliance focused on investing into the expertise and selforganisation of people by offering ongoing training, mentorship and relation building. Establishing collaborations with nearby food retailers was meant to intercept local organic 'waste' streams toward creating a horticultural cottage industry on the rooftops with a variety of niche applications as sketched out in the following graphic (figure 16). The proposal foresaw to utilize the funded one-year period for building local expertise and attracting outside investment.

(figure 16) **Instigating a meshwork of foodscapes in urban niches**

The proposal featured a pluriverse of ideas how in the given urban reality organic 'waste' residues could with socially powered conversion processes transform staircases, back alleys, rooftops and even transit points into community gardens.

The proposal was declined by the foundation without any further comments. Without any backing, committing and fostering citywide garden communities seemed elusive. In addition, rooftop gardens are subjected to transactions of the property market. Two out of the five urban farms that originally signed onto to the collaboration have ceased to exist within two years to make space for urban redevelopment projects. The Garden Alliance idea had to be shelved as well.

4.3 · Collaborations with productivity concern

The Upcrafting Ventures were footprints on a path of ‘stumbling forward’. The first phases explored, how open forms of biochar production and its associated benefits can stimulate social or educational processes. Providing for the wellbeing of communal and environmental ecosystems was viewed as worthwhile and value-giving proposition for people involved. The first eight ventures in the art world and civic arena showed how the ‘common good’ is not appealing enough to get people and institutions to change their dealings around organic residues.

Terra Preta Black Soils are not just a subject of idealistic Upcrafting Ventures, they can generate marketable value. High quality biochar (carbonised from pure woody residues) and derivative soil products or licences are priced commodities (Schulze & Traber, 2011). Thus, entrepreneurial avenues were explored within the scope of this study. The Botanical Garden in Berlin or Greenport mobile toilet service in Zurich are lucrative business models with humus from human ‘waste’ (Sturzenegger, 2017; Wagner & Suer, 2015). With limited time remaining, it was to be explored, if a small upcrafting startup could be established, that relied more on people power than fancy tooling.

4.3.1 · Biochar from spent grain at HK Beer Co.

For producing high-grade, plant-based biochar, untreated woody or fibric residues such as pure sawdust or husks (outer hulls covering the kernel of grain) are most suitable as input material. In Hong Kong with marginal wood-working and rice-growing activity, the local beer indistry came into focus. As byproduct of beer brewing, tons of spent barley grain are being disposed. The Hong Kong Beer Co. for example, produces on average 500 kg of spent grain daily, for which it pays monthly disposal fees of HK$ 3000. When the researcher contacted the microbrewery and suggested to upcycle the spent grain from ‘waste’ to potential revenue stream, the business management got interested.

In the makeshift proposal, a small-scale, scientifically guided social biochar venture with minimal infrastructure investment was outlined. Social venture meant to substitute high-tech processing with manual work that would benefit underprivileged locals looking to

supplement their income. One crucial aspect in biochar production is to demoisturise the spent barley grain before carbonisation (pyrolysing), since it consists 85% water. Energy-efficient pyrolysis is an aerobic, high-pressure heat treatment that requires less than 10% of moisture. Instead of relying on industrial-style drying facilities, the wet grain could have been sun-dried on the rooftop of the brewery with assistance of local workers. Scientifically guided meant that the scientific co-supervisor of this study saw a research opportunity to monitor and optimise the processing standards of this grassroots biochar operation over time. Without a precedent for such a venture in Hong Kong, it was communicated with the microbrewery that new markets for the biochar as soil amendment or biofilter would have to be established.

In successive meetings it became evident that the brewery management was primarily interested in generating revenue from 'waste', with minimal risk. In such a calculative approach, only standardised, state-of-the-art pyrogenic facilities are able to generate certifiable biochar products. It is expensive, requires large volume, and investment. An industrial pyrogenic biochar facility only make sense when it integrates with a local energy planing so that excess heat (steam) harnessed to power nearby production processes or heating systems (Schmidt et al., 2018). Such an engineered was not in the scope in this study.

4.3.2 · Black Circle (雲土間)

During the regular biochar firing sessions at the Zero Organic 'Waste' Home the researcher and the R.I.O.T. team contemplated other business ideas for organic recycling and entered the business incubation programme of the 2015 Green Building Ideas. Facilitated by a consortium of construction businesses, 'green' startups were sought with pro-environmental solutions for the built environment. The program offered, over an entire summer, design thinking workshops, an intensive 'Sustainability Hackathon' and two-month mentorship with a social entrepreneur expert. The group entered with the idea of 'Black Circle (雲土間)', a biochar purification product with a social network dimension as indicated in the next graphic (figure 17) that would be produced from woody construction 'waste'. Mentored by Andrew Tsui, a renowned urban farming entrepreneur, Black Circle was shortlisted for the final pitching event to compete for a startup seed money.

(figure 17) **The prototype of a networked detox ecology**

The origins and destination of the trackable Black Circle purification product would allow users to learn and contribute to a joint and evolving narrative of an unwaste ecology.

The shortlisting of the Black Circle idea was unexpected at a moment when the researcher and Wanho Tam conducted fermentation research on Jeju island (4.1.3). It did not stop the R.I.O.T. team from pushing the business proposal forward and producing a persuasive pitch presentation. The key figure in this eco-business campaigning became Wanho Tam's friend Benson Law, a marketing specialist at a major newspaper and a craft enthusiast. Benson and the R.I.O.T. team were well aware of the triple weakness in Black Circle's business plan: it lacked the market-ready, deployable product; it had no confirmed investment partners; and (again) there was no documentable precedent. Thus, the R.I.O.T. team tasked itself to compensate a hopeless business plan with utmost originality, persuasion and group spirit. In absence of the researcher, Benson and the R.I.O.T. team mobilised a volunteer production crew with the main protagonists (figure 18) and produced a promotional video clip titled *Black Circle: Join the Detox Economy*[20].

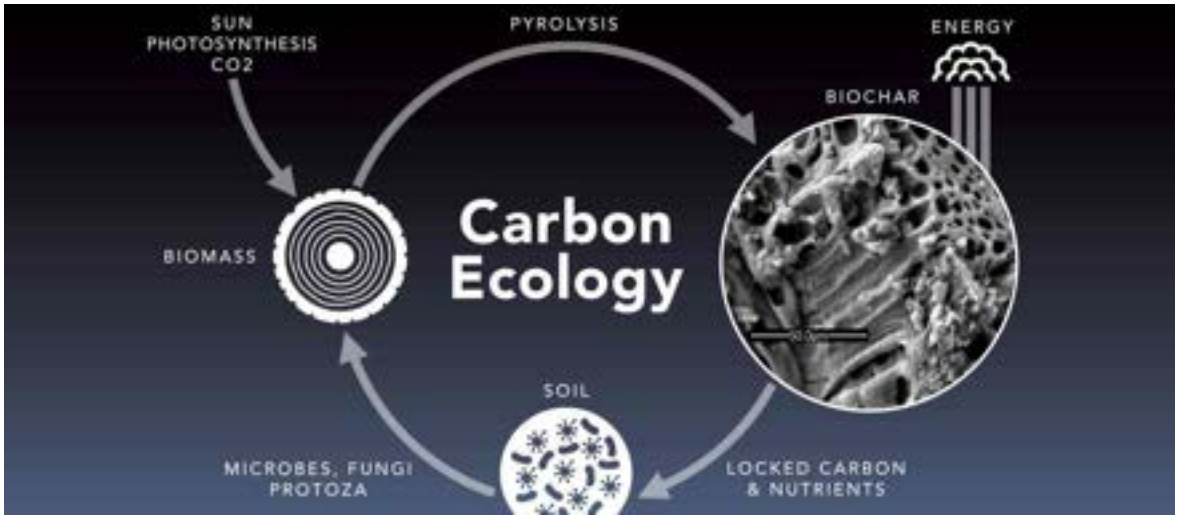
[20] The three-minute long promotional video clip 'Black Circle – Join the Detox Economy' is viewable online on Vimeo: https://vimeo.com/198452933

(figure 18) **The main protagonists of the Black Circle promotional video**

The tale of a 'detox ecology' with four protagonists who bring their organic 'wastes' to the Kung Fu firemaster for purification (biocharring) [video still, curtesy Benson Law].

Black Circle presented at the final pitch a re-sourcing enterprise that tried to provide more than just another 'green' product. It envisioned a bio-active filter, that carried the potential to reverberate through mental, social and biophysical ecologies as indicated in the following chart (figure 19). Made from hand-sorted, wood-based construction 'waste', the high-temperature charcoal dust would be packaged into stylish biochar pouches. In this form the biochar could serve as water purifier and home demoisturiser, thereby detoxing the home spheres including drinking water, shoe interiors, drawers, or closets.

(figure 19) **Biochar's regenerative properties**



Detail of slide show presented at the Green Building Pitching Event *in September 2015.*

Adding social dimensions to the product life cycle, the biochar pouch was equipped with a dynamic tracking system and thereby embedded in an app-based communication exchange. This Black Circle social ecosystem would allow woodwaste producers, and detoxing homemakers to enter socio-ecological circulations. The QR-code on each product batch would be the entry ticket to trace the origins of the biochar, get to know processes and people involved, and weave one's own experience into the emerging narrative of the detox ecology. Importantly, Black Circle would offer a take-back program ensuring an afterlife for the spent biochar pouch. The durable biochar can be decontaminated and reused as wall building component, surface treatment, and soil amendment. People who return their biochar pouches would receive report on how their spent product was reused and applied. This way, product use cycles and customer relationships could potentially continue forever.

This speculative business dreaming ended abruptly at the final pitch illustrated in the photograph below (figure 20). When most competing startup teams had already secured investors, production partners, and solid marketing strategies, the Black Circle idea must have appeared as groundless fiction to the jurors. The Black Circle was ranked second to last out of ten proposals. The jury deemed the logistics as unfeasible, questioned the demand for biochar retail products, and feared that production process (pyrolysis) and product hygiene (reuse) would violate government regulations.

(figure 20) ***Green Building Ideas*** **pitching event**

The Black Circle team presenting their idea of a social detox ecology at the five-minute business pitch.

4.3.3 · Full Moon Char Soirée

Having had no success with promoting biochar as a socially reverberating retail product, there still were avenues to be explored for biochar-related services. With the biochar firings on the rooftop of the Zero Organic 'Waste' Home getting media attention, and the Mid-Autumn Festival around the corner, the R.I.O.T. team organised an open house event. This Full Moon Char Soirée was an 'educational bazaar' with seven different parallel workshops on offer for the paying visitors of the rooftop function shown in the next photograph (figure 21). Soirée visitors could hone their organic upcrafting skills by cooking burger paddies from tofu residue; carbonating compostable tableware from scavenged palm leaves; preparing their bokashi bedding from local ingredients; making kimchi from leftover vegetables; assemble planters and chairs from recycled wood pallets; baking mooncakes with homemade sourdough; and, ferment urine into odourfree fertiliser.

(figure 21) **Instruction on do-it-together biochar carbonisation**

A climate farming activist from Taiwan takes the opportunity to share her expertise in biochar production and application.

The Full Moon Char Soirée was well attended with three dozen visitors joining the biophilic activities on the rooftop. Visitors included farmers, locavores, bioscience aficionados, educators, garbage activists, musicians and socialisers. So much probiotic rooftop activity also begged for a barbeque party inside the urban scenery of Tai Po Market. The manifold activities offered something for everyone as the next photograph illustrates (figure 22).

(figure 22) **Bokashi workshop on the urban rooftop**

Before the barbeque and party, Soirée guests were invited to help inoculate 50 kg of rice bran to produce indigenous bokashi.

Overall the fermentive bazaar demonstrated the desirability of an enlivened rooftop that normally is underutilised. The agroecological maker happening temporarily transformed not only the place but also the group and people involved. Strangers gathered around seemingly useless bioresidues, picked up skills, and engaged bodily-sensorily with vibrant materiality. Besides 'waste' that was upcrafted into localised forms of provision, also people became part of a joint situation that was larger than themselves.

Despite overall positive responses from visitors, the one-off Full Moon Char Soirée was a time-consuming effort for the organisers with minimal long-term impact, similar to the 'low-carbon' workshops (4.1.4). While the one-stop upskilling program offered a lot of diversity, the motivations among visitors also differed widely. Some enjoyed the freedom of the rooftop, others tried to acquire expertise, some came for the spectacle, and others came simply to party. To a certain degree, the rooftop gatherings around the Zero Organic 'Waste' Home could feel like fast-paced 'eco-entertainment'. It meant that the researcher and organisers were no longer able to relate on a deeper level with participants and the activities on hand. The Full Moon Char Soirée was mainly about action, technique, and selfhood, whereas reflection, dedication and otherness could easily go missing.

4.3.4 · Turning ‘Waste’ into Gold

When a biophillic upskilling bazaar was hard to keep up, then concentration in one area of application could be more viable for an educational business concept. After one year of compost crafting trials, the Zero Organic ‘Waste’ Home had adapted a self-sufficient, non-industrial technique for processing heavy duty putrescibles, including human ‘waste’, that was unique in Hong Kong. Controlling odour emissions of the biomass at collection point in subtropical conditions can be challenging. In a metropolitan area without decentralised bio-recycling infrastructure in place, distances between material collection and composting site can be long. Therefore, the primary concern at the Zero Organic ‘Waste’ Home was to stabilise its putrescibles and human ‘waste’ right at the source. In an approach oriented at retaining nutrients and enhance soil ecologies, stabilisation ought to minimise the use of chemicals, electricity or combustion. Processing in airtight buckets for anaerobic fermentation is a sensible choice since it employs *innate* bacterial transformations. Thus, early on at the Zero Organic ‘Waste’ Home, efforts went into generating a microbially active bedding material for clean, indoor-friendly bioconversion. This in-vessel fermentation of organic residues known as bokashi is preceding the composting phase.

Bokashi processing is based on inoculated bran, a byproduct from the milling process of wheat or rice. Each input of organic residues is covered with a layer of the inoculated bran (plus biochar dust if available), then compacted to eliminate air. When the collection bucket is full, it is stored for three weeks prior to composting. Bokashi has become popular because it is permissible for organic leftovers usually banned from compost: meat, oil, processed foods, dairy, and—human faeces. Industrial bokashi is imported and sold in Hong Kong at eco stores and garden centres yet since tons of rice bran are discarded daily (from the two Japanese rice mills in town), the R.I.O.T. team had developed a do-it-together version, inoculated with indigenous yeast cultures that are sourced from local bamboo groves as the next photograph demonstrates (figure 23).

(figure 23) **Harvesting yeast strains from bamboo mycelium for bokashi adventure**

Leftover and cooked rice from the university canteen was used as attractant for propagating bamboo mycelium into yeast cultures (the white fluff inside the containers) for inoculating the rice bran

Soon after the indigenous bokashi-making at the Full Moon Char Soirée, the university's General Education Unit which runs the Rooftop Farming Project at Hong Kong University contacted the R.I.O.T. team for facilitating a composting workshop. This student-led community garden is part of the university's attempt to reconnect students to sustenance and the natural environment. The General Education Unit organises a number of food-growing workshops while student volunteers to look after the garden. The farm facilitators indicated the possibility of a future composting operation for reintegrating food 'waste' from school canteens into fertiliser. Facilitating a bokashi composting workshop was meant to help evaluate how to proceed in this matter.

A one-off, two-week long bokashi workshop without subsequent processing does not make much sense. The fermented output from the bokashi process needs to be composted over three to six months (in subtropical climate) with addition of woody inputs, soil seeding, etc. For this reason the R.I.O.T. team prepared a comprehensive proposal for a biochar-based composting operation. Reaching beyond what the General Education Unit asked for, the proposal Terra Preta Black Earths for HKU (see appendix) was oriented at collaborative learning *over time,* where facilities and operation could be adapted to the emergent needs of management and students. The document outlined structural set-up, processing and future workshop themes without budget details to leave room for negotiation.
The researcher hoped such educational compost venture could eventually allow for integrating bioscience research around biochar, or even a dry toilet on campus. The

following Terra Preta/bokashi composting schedule (table 7) is an excerpt of the proposed compost concept, listing the compost phases in relation to efforts required.

(table 7) **Proposed stages of Terra Preta/bokashi composting for rooftop farm at Hong Kong University**

Stage	*Component*	*Input*	*Output*	*Time*	*Material*
1	**Indigenous Bokashi**	rice bran, bamboo rhizome, cooked rice, sugar, water, food 'waste', soybean residue	fermented, preprocessed (stabilised) food 'waste' (pH 4.0-5.5)	21 + 28 days	Bokashi rack with two 60L reactors, one 60L bedding barrels, wood crates for microbe generation
2	**Earthworm Farming**	Red wiggler (*Eisenia foetida*), spoiled fruits, coconuts husk, soil, newspaper snippets	doubled worm population	28 days	Worm rack (sheltered) with storage for bedding material, pH dye indicator, and thermometer
3	**Biochar Production**	wood 'waste' (untreated), rice husks, used sugar cane	Durable, clean pyrolysis charcoal for soil amendment	1-8 hours	Rocket stove (200L steel drum) with retort (120L steel drum) and chimney, fire extinguisher
4	**Thermic and Vermin Composting**	fermented food 'waste' (stage 1), garden residue, tree clippings, manure, biochar, ashes, sand (volcanic rockdust) + worms + water	Fertiliser	180 days	Triple compost bin with roof, soil thermometer, pH dye indicator, hay fork, plant clipper or shredder
5	**Fertiliser Application**	substrate from stage 4 (ratio 1:5), mulching material	Reinvigorated soil		Shovel, wheel barrow

Production of indigenous bokashi is a three-stage, successive inoculation process totalling three weeks. Preprocessing biomass with bokashi takes up to four weeks. The conversion into veritable humus takes a minimum of eight months in the subtropical conditions of Hong Kong.

In the end the General Education Unit wanted simply to a guest workshop on indigenous bokashi at their premises. Aligning microbial succession periods with the tight timeframe of the course was a challenge. Since the aim was to let students experience all process stages, bacterial lead times and utilisation of the given facilities needed to be well planned. The production of bokashi from scratch includes three steps of bacterial cultivation – mycelium attraction, mycelium propagation, bran inoculation – that entail weekly successions. For students to engage with all stages in this two-part evening course, it necessitated to calculate fermentation leadtimes and the staggered curing of bran to provide sufficient samples from all fermentation stages. Therefore, preparations started six weeks prior to course with more than 100 liters of *bacterially charged* bran for a total of 20 bokashi students.

The non-credit course proved to be very popular and well attended. In the first session, students were taken around the campus to bamboo groves for sampling traces of mycelium, the bacterial life inherent in the root network. At the school canteen, cooked leftover rice was collected. The starch in the rice serves as attractant for the yeast cultures in the mycelium. The white, fluffy yeast harnessed on the rice, in addition with sugar, sauerkraut brine and water is marinated (cured) into the rice bran as shown in the next photograph (figure 24), thereby inoculating it. After the first session, students received a bucket with activated bokashi and the homework assignment was to fill it with kitchen scraps until the next session. When the students returned the week after with the filled and fermented buckets, they were instructed on the composting process.

(figure 24) **Inoculating rice bran at Hong Kong University rooftop farm**

Students and workhop facilitators are marinating 200kg of fresh rice bran with a concoction of yeast and lactic adic bacteria. Fresh rice bran contains valuable trace minerals and oils: in contact with bacterial cultures and working hands, ethereal material qualities emerge like a silky touch and honey-sweet smells that make curing an delightful experience.

Freshly milled rice bran in contact with the activated yeast smells like freshly baked bread and has a delightful smooth touch. The students enjoyed the microbial scavenging around campus and working them (in inoculated form) with bare hands into the heaps of rice bran. The complimentary demonstrations of biochar making and vermicomposting was greeted with keen interest and questions. Several students continued bokashi-collecting their kitchen scraps and brought them for composting to the campus rooftop as indicated in the next photo sequence (figure 25). One student carried on the practice even after she had moved house to Lamma island (an hour-long commute away from campus), and requested an indigenous bokashi course for the garden group at her new home. Another bokashi student

commuting from afar, carried the bokashi bucket in the subway back and forward for months after the workshop.

(figure 25) **Exploration of a community-led compost initiative**

Bokashi workshop student delighted about the homework of collecting food 'waste' for the compost pile on the campus rooftop garden [photos courtesy of the bokashi students].

The Turning 'Waste' into Gold workshop was a tiny step in the right direction: twenty participants were engaged during two consecutive evening sessions. And a few of made small adjustments in their daily lives over at least two weeks since campus farm, material expertise, and the workshop group provided temporarily a purpose.

4.4 · Mobilisation with practicability concern

After 20 months of dedicated, material *provotyping* – in form of stagings, proposals, startups – it became apparent how the Upcrafting Ventures were simply too adventurous in the given educational and business framings. In all attempts, integrating human 'waste' was *the elephant* in the room—a seemingly impossible proposition. In the educational frame of the bokashi workshop, the interactive dimension of acquiring and sharing skills as way for approaching the human role in the nutrients cycle, clearly resonated with participants. Yet, the cycle was never fully closed and students were prevented from experiencing the regenerative act of composting—let alone, regenerating agroecologies through their bodily, digestive functioning.

The tireless Upcrafting Ventures led to two basic realisations. First, after subjected to several hundred years of sanitary regimes, urbanised humans by and large, have indeed lost the connection with the natural foundation (Waltner-Toews, 2013). If such a systemic disconnect is ever going to be addressed in any comprehensive way, it deserves full attention. Specific activity domains would need to be established that do not exist as of yet. Therefore, trying to piggybacking the reuse of human 'waste' onto other-determined, well-meant intentions (in art, business or education) was certainly going to further derail the intention of this study. In this sense, the provotyping field experiments were not only self-restricting, they apparently lacked *real courage*. The first dozen Upcrafting Ventures tried to be alluring through implementing imported expertise: Pre-Columbian Terra Preta or biochar magic were supposed to grant permission for using human 'waste'—introduced through the back door. Human 'waste' once again was to be concealed and kept at 'safe' distance for all kinds of preconceived reasons. At that point the realisation sank in to change course. It was time to be more adventurous in spite of an overly fearful world. The time had come to serve up human 'waste' on the silver plate—or better, in the scientific beaker.

In a study that makes human 'waste' the driver of the experience, it was necessary to direct the situation of participants as much as possible. This implied platforming, expertise building, and opening activity domains all at once. Doing something sensibly meaningful with human 'waste' is strictly bound to biological timelines. Therefore, it was pertinent to bring participants into an experience that would capture simultaneously their determination, routine and effort. To accomplish this tall order, human 'waste' had to serve an irreplaceable purpose, and participants needed to be in charge of their experience. According to humanist educational tradition (introduced in 2.1.3) establishing such experiential intensity requires intensity through alterating the familiar with unfamiliar for putting habits in perspective over time. It required breadth from transferring expertise from one life domain to another. And, the experience needed to have significance where validation derives from combined function, durational meaning and identification (Gilsdorf, 1998). Not unlike the cultivation model of Mango King, the homeless homemaker (noted in 4.1.1), the main study had to bring people into of a value chain creation that *necessitated* the reuse human 'waste'.

By rehabilitating human 'waste', focus could be narrowed and possibilities opened. There was only a six-month window left to prepare and conduct the participatory study, so the

utilisation of faeces was agroecologically impossible. The Terra Preta Sanitation method applied to Hong Kong conditions requires at least six months to hygienise and convert faeces into veritable Black Soils. Another three months are needed to grow anything edible out of it. The viable agroecological material for codesign was therefore urine. This brought back discussions with permaculture practitioners in Jeju (4.1.3) about upcrafting urine for use in water-based, hydroponic planting as shown in the next photograph (figure 26).

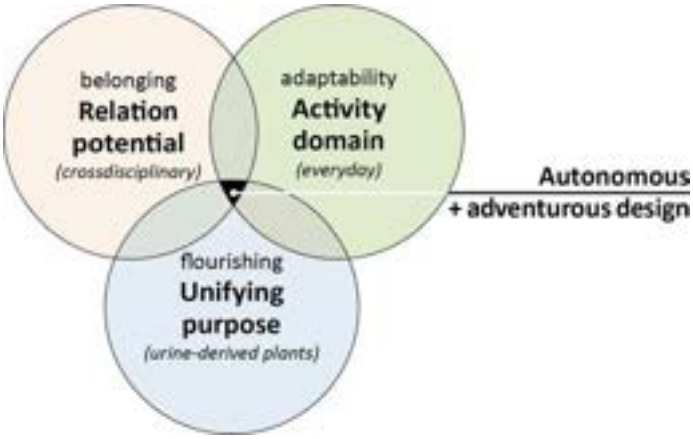
(figure 26) **Urine as agroecological codesign material: Aquaforming Mars! installation**

200ml beakers with ivy plants and lettuce growing in anthropogenic nutrients solution from urine specimen of gallery visitors (shown in the background).

The emancipation of human 'waste' was endorsed by trifold serendipity. Firstly, microbiologist and Terra Preta Sanitation expert Nadejda Andreev invited the researcher to co-author an environmental science paper on urine fermentation: the trials at the Zero Organic 'Waste' Home contributed insights regarding the acceptance of procedures and the olfactory judgement of fermention quality (Andreev et al., 2017). Secondly, the Eindhoven-based biodesigner, Sarah Daher, contacted the researcher to collaborate on a urine-powered miniature foodloop. Her expertise in product design and horticulture complemented well the researcher's affinities for microbial and social collaborations. Also, through conversations in the R.IO.T. team and during house visits, it was observed how some frugal Hong Kongers are drawing on foregone Chinese agroecological tradition – Night Soil – and irrigate house plants with a splash of their own urine (transcript, intake interview Cliff Chen). Apparently, such life-hack fertilisation is producing rather mixed results (ibid). Only month-long stored urine can supply plants with *mineralised* nutrients. In fresh urine the nutrients go literally up into the air as smelly ammonia, referred to as volatilisation (Trejo-Téllez &

Gómez-Merino, 2012). Leveraging clandestine fertilisation practice was a welcome opening for this study because it revealed an unfinished, dissatisfactory situation that pulled together relation potential, activity domain and a unifying purpose as shown in the following Venn diagram (figure 27). Thirdly, in late 2016, art curator HyunJu Yu commissioned an art installation on this adventurous homemaking for an exhibition concerned with climate change at a chemistry research centre in Daejeon.

(figure 27) **Emancipatory elements of the 'unfinished situation'**



The field experiments brought about a creative opening to be explored in the main study by confronting a dissatisfactory situation toward a shared and commanding task.

Through endorsement from environmental biologist Nadejda Andreev, art curator HyunJu Yu, and research supervisor Timothy Jachna, funding was secured from the Dutch Creative Industries and Design Trust in Hong Kong. It supported the professional facilitation of the participatory study and would allow the initiative to outlive this study project. Emancipation of human 'waste' was about creating a niche where preconceptions are suspended and something untouchable can be reapproached. In this study emancipation is understood as the beginning of "autonomous design" (Escobar, 2018b). Regarding activity domain, emancipation meant that the home and everyday routines are not sacrosanct but the locus of transformation. With supported courage, the home becomes the most significant site for meaning, reflection and change.

If emancipation of human 'waste' is not limited to household-level toilet routines, but about human homemaking on this planet, the activity domain radically opens up. When human 'waste' is emancipated, every sphere of human presence and influence becomes a site for

homemaking investigation. As long as humans are *inhabiting* metabolising bodyminds, the gallery, chemistry lab, or expedition to Mars is subject to adventurous homemaking. In this way, the public engagement in the gallery could be harnessed as a dress rehearsal for emancipating human 'waste' by testing ergonomics and engagement in urine upcycling. Homemaking as decidedly autonomous upcrafting venture, presents participants with a mobilising experience that provides them all at once—a common task (demand), companionship (support), and self-responsibility (agency). Human 'waste' now was viewed as the entry ticket to an adventure waiting to be unleashed in the (un)familiarity of the home.

4.4.1 · Aquaforming Mars! (아쿠아포밍 마즈!)

For the inauguration of an exhibition building on the campus of the Korean Research Institute of Chemical Technology in Daejeon, the researcher was commissioned to realise an installation in early 2017. In this group exhibition the given theme was "A Message from Mars: Special Exhibition in Chemistry Art Responding to Climate Change" (Lee, Go, & Yu, 2017). The exhibition theme was was a critique on the intensifying efforts of colonising the Red Planet in relation to the environmental crisis unfolding on planet Earth. The shared sentiment among participating artists was that it can be considered escapist when humankind invests into an illusory backup habitat 54.6 million kilometres away at a time when the interexistent life carrying capacity on the 'mothership' is being diminished.

Taking place at a science campus, the organisers' intention was also to assert the contribution of state-of-the-art chemistry in addressing and mitigating climate change. The six contributing artists were asked to respond to the Message from Mars by incorporating aspects of pro-environmental, chemical technology in conception or realisation of their artwork.

However, the ambition for contributing to this exhibition were utilitarian rather than artistic. The public situation of the art exhibition provided a welcome testing arena for the enrolment involved when using urine as diagnostic means in environmental health relations. The opening reception attracted about 150 persons and the opportunity to probe acceptance, handling and subject interaction of urine collection and analysis. The time-pressed preparations leading up to the installation shown in the next photograph (figure 28),

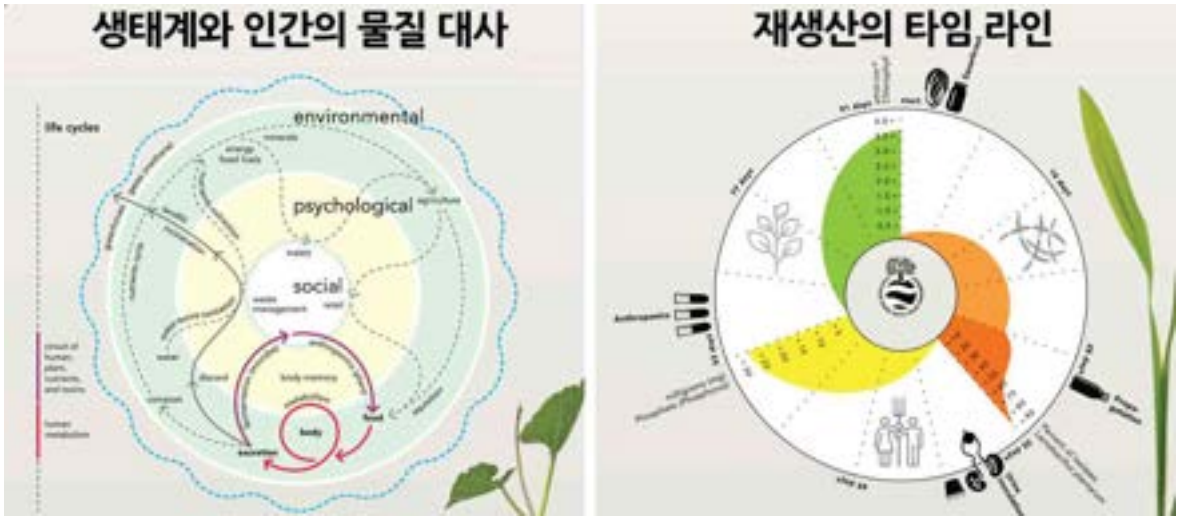
were also a test run in the collaboration between researcher and biodesigner Sarah Daher. They were tasked to bring archaic fermentiveness and urine into an intriguing, mobilising experience. Balancing the organisers' expectations with the study's activist intention, culminated in a participatory performance titled 'Aquaforming Mars!' (아쿠아포밍 마즈!).

(figure 28) ***Aquaforming Mars!* at the chemistry research campus**

Gallery visitors were invited to inspect the urine-grown plant samples, learn about the agroecological vision for feeding Martian communities, and donate their urine as interplanetary investment of life energy.

In a fictitious take, Aquaforming Mars! was set up like a combination of clinic parlour and travel agency. During the opening reception on 23 January 2017, gallery visitors were invited to have their urine samples taken, tested and annotated so it could help fertilise a hydroponic orchard on Mars. The utopian promise of this 'donation rally' for urine samples destined to Mars was to feed the steady increase of human colonies in the deadly, extraterrestrial environment. *Aquaforming* is a neologism that plays off the terraforming narrative, a profoundly illusory desire to remake other planets, so they resemble Earth (Pak, 2014). *Aqua* referred simply to the importance of the water cycle in bacterial processes so foundational to all life forms known on Earth. Aquaforming also describes the craft of fermentation since microbial activity depends on moisture thereby can be also understood as a form of 'wet-crafting'. This socio-material cultivation relying on the water cycle was showcased at the installation in the following infographics (figure 29).

(figure 29) **Contemporising ancient cultivation technique**



Details from educational posters of the Aquaforming Mars! *installation: Fermentation was visually represented in Guattari's Three Ecology model (left) and in an aggregation chart that displayed nutrients retainment and biomass production.*

At the opening, interested visitors were equipped with instructions and a 'Urine Donation' package that included a urine diversion funnel for women ('Urinelle'), a urine dipstick test ('Urinalysis'), and a collection cup. After self-sampling their urine at the nearby toilet, the hopeful Martian plant fertiliser would return to the *Aquaforming Mars!* clinic parlour inside the gallery and complete the Urine Donation Log shown in the following leaflet reproduction (figure 30). It was a short form to enter the Urinalysis results, report recent foods eaten, state aspects of body constitution, and leave a personal message to the plants being fertilised. Urinalysis is a dye tester (akin to a pregnancy test) for self-evaluating ten different medical indicators in the urine such as glucose, nitrites, blood, protein and pH value.

The trans-species message to the plant, was meant to make donors reflect on a deeper level about their place in the world. It turned out to be a major challenge for most of the urine donors. The urine samples were labelled and presented next to a hydroponic plant incubator that was breeding lettuce and basil in urine-fertilised water solutions. The Aquaforming Mars! installation also featured a background banner displaying a Martian landscape with an imaginary human colony and suspended water-growing plants in glass beakers to lend a sense of alien adventure.

(figure 30) **Urine Donation Log for anthropogenic nutrients destined to Mars**

Urine-donating gallery visitors were asked to complete a questionnaire to endow their nutrient specimen with aspects of their personality in an effort to put their demeanour in consequential relation to potential inhabituation of Mars.

About 20 adventurous visitors donated, dye-tested, and annotated their urine with the Urine Donation Log. Being familiar with urine testing in medical examinations, the donors easily adjusted to collection procedures. The difficulty lied in completing the open-ended questions of the form. Lacking any prompts or multiple choices, people were challenged to list and prioritise their food intake and bodily states. Despite these disconnects and distractions of a busy opening reception, some urine donors were able to speculatively reflect on person-related properties in urine that may be passed on from human to plant as the following snapshot shows (figure 31). One aquaforming donor regretted not having eaten healthier prior to the donation. Another donor expressed the feeling of being too old to move to another planet, instead was interested to visit and witness the flourishing of 'his' vegetal offspring. There was also a donor confessing to the plant-to-be-fertilised about personal loneliness and history of drug abuse. This short group interaction confirmed how urine is a highly private and incredibly complex substance that can raise sensitive issues. Instead of pushing speculative, interexistent connectivity, the focus shifted to how own behaviour brings forth thriving in what emerges from socio-material engagements.

(figure 31) **Private consultation for urine donation destined to Mars**

A homemaking and consequential collaboration of humans in dialogue with themselves, bacteria and plants.

In preliminary discussions with the curatorial team in Daejeon, including leading scientists and the marketing director, the question was raised whether urine fermentation could be considered chemical technology and whether it relates to the topic of climate change. Strictly speaking, fermentation, especially the non-industrial kind applied in this study, can be considered a biochemical cultivation *technique* rather than chemical technology. 'A Message from Mars' was meant to strengthen the legitimisation of advanced chemical technology in the fight against climate change. In preparatory discussions, the chemistry scientists in Daejeon encouraged the participating artists to engage with climate-mitigating technologies like carbon dioxide resourcification, carbondioxide removal, artificial photosynthesise, or stratospheric aerosol injection. Propagating archaic, do-it-together fermentation was an attempt to complement such intentions. The installation featured a series of posters that indicated how fermentation can be a biochemical measure in a holistic cultivation strategy of stabilising nutrients, building up humus, increasing biomass productivity, and thereby absorbing carbon from the atmosphere into living plant matter (Rockström et al., 2017, Hansen et al., 2017). Aquaforming Mars! was meant refer the outlandish concept of terraforming back to into a sincere consideration for cultivating planet Earth rather than the Red Planet.

Although Aquaforming Mars! did not fully align with the organisers' agenda, it served its purpose of improving acceptability of urine-based indoor planting and helped build momentum in facilitators and the backers that would help convince participants to join the main study.

4.4.2 · ANTHROPONIX (人類水培)

After 20 months of consistently short-lived, one-off, encounter-making attempts, the main study set out to engage urban people with human 'waste' and their biophysical foundation in a durational effort. Akin to Aquaforming Mars!, in the main study urine was the usher into a biochemical dialogue with the living world. The idea of entering communicatively into interexistent circulations was reflected in the first working title 'Harboring Organisms, Sharing Tensions (H.O.S.T.)'. It was an attempt to design an experience able to contemporise – to make relevant in the Here and Now – old folk knowledge of fermentation with a fuller appreciation of the regenerative capacity inherent in every expression of organismic existence. The H.O.S.T. funding application featured on the front page this self-confident quote:

> Converging indigenous knowledge, symbiotic tactics and bio-responsive aesthetics into a citizen science study (and subsequent practice) we are probing the 'basics of life' in Hong Kong to reignite the magic underlying the living interrelations of plants, bacteria and human nutrients [proposal for internationalisation grant of Dutch Creative Instustries].

Living interrelations and flourishing stems from nurture of other-than-self life. The field experiments made evident how justifying the upcycling of human 'waste' with soil stewardship or ecosystem services alone does not suffice. It is too abstract and removed from urban peoples' experience. More convincing is the immediate, regenerative use value, as impressively demonstrated by homeless guerrilla farmer Mango King (芒果王) above (4.1.1). Unlike Mango King who was adventurous enough – and thereby privileged – to cultivate 6,000 square feet of underused, arable land in the middle of the city, the horticultural passions of Hong Kong's population are vastly confined to the indoors. Most rooftops remain underutilised in Hong Kong because they are considered too exposed or too burdensome to be appropriated (Pryor, 2016). If the study was to ever engage anybody beyond Mango King into recycling their human 'waste', it had to be tamed and housebroken, for use in indoor planting. It is in the crowded, light-deprived flats of residential towers, were many Hong Kong people are tending to plant life for decorative and productive reasons.

The lack of balcony space and natural indoor lighting disadvantages soil-based planting because it is bulky, heavy and messy. In recent years, appliance-sized versions of

hydroponics, have made a foray into Hong Kong homes. In these soil-free, LED-powered horticultural incubators are breeding plants in aerated water solution that contains petrochemicals specified to the nutrients needs of plant variety. Indoor hydroponics is not only growing crops without sunshine, it does so in about half the time of soil-raised plants (Trejo-Téllez & Gómez-Merino, 2012).

The hydroponic plant breeder miracle poses environmental liabilities. They rely on external fossil fuels for electricity and nutrients input, and add to contaminating waste streams with plastic wastes and effluent minerals. On the other side of the horticulturist spectrum, the study stumbled upon ad hoc urine fertilisation tactics at frugal homes (noted in 4.1). Intersecting these two unsatisfying situations, the sweet spot for the participatory main study had arrived. Fermentation could be used to stabilise and convert urine as endlessly renewable and human-derived nutrients source for then growing plants in water with the magic of hydroponics as the next photograph indicates (figure 32). At least this was the plan and inspired the second work title for the study: Golden Growing.

(figure 32) **Biopedagogic tracking with limitations**

The study relied mostly on analogue self-tracking instruments like hydroponic solution measuring and dye testers.

Scientifically guided, craftivist social experiment: Golden Growing wanted to bring people and plants into a consequential entanglement and for testing out the symbiosis of ancient cultivation technique and high-tech horticulture. Scientifically guided meant that the preliminary urine-to-water, plant-growing experiments at the Zero Organic 'Waste' Home was receiving remote advise from scientists. Urine-powered hydroponic experiments were already conducted by environmental engineer Henrique Aiveca Sanchez (2014) and his

colleagues at the Hemmaodlat Urban Food Institute in Malmö for several years. The researchers operated a 300-liter aquaculture system for combined urine treatment and vegetable growing. The eco-engineers's urine-infused aquaculture was not as fast-growing as the petrochemical hydroponics but yielded successfully cucumbers, lettuce and basil (Sanchez & Hjelm, 2016). Scaling down the 300-liter ecosystems into cup-size dimension for the main study was a challenge. Sanchez assisted the researcher in the technical aspects of nutrients supplementation, urine dosage, growth monitoring, and lighting. Conversely, the researcher supported the implementation of urine fermentation for the hydroponic system in Sweden: in addition to crops, Sanchez' aquaculture also produced unpleasant malodours since the urea of unfermented urine is highly volatile and emits ammonia (Jones, 1997:82). Several Skype conversations and growing trials later, lettuce, water spinach and bok choy were growing reasonably reliable in 200-millilitre beakers at the Zero Organic 'Waste' Home.

200-millilitres are equal to the volume of a tea cup. It allowed to grow many single plants as control samples on a small footprint for correlating them to the series of urine specimen that would fertilise them. In Golden Growing urine became a biopedagogic vehicle that would transcend the boundaries of nutrients and toxins, wasting and flourishing of interexistent living. Co-facilitator Sarah Daher designed a compact contraption for upcycling 21 urine specimen, for then growing 21 plant seedlings respectively.

A social experiment by its nature necessitates people. Aside from miniaturising urine cultivation, and shaping human-plant interfaces into contraptions as shown in the next photograph (figure 33), a solid engagement concept was needed to captivate aspiring adventurous homemakers. Closing the foodloop, from collecting urine to harvesting something edible – in the most optimal scenario – would take six full weeks and likely longer. The concern was to find participants in Hong Kong, willing to store their urine at home, grow plants out of it, and stay committed to the project. Marketing professional Benson Law instrumental in the promotion for the Green Building Pitch (detailed in 4.3.2), collaborated with the researcher in developing a comprehensive engagement strategy. Benson took the dedication to understand the deeper, biopedagogic intentions of the study and stubbornly confronted the researcher with questions on behalf of potential participants. In this anticipatory dialogue all procedural steps were attentively rehearsed through mockups and enactments together with research assistant Lai Kahang. This way the topical

structure of the workshop series gradually took shape and the team of co-facilitators established a shared sense for what this exploration was about. This process also entailed to find the appropriate language. Golden Growing did not translate well into Cantonese, and had undesired connotations in English. Eventually the study was renamed into ANTHROPONIX (人類水培): From Greek *anthropos* for 'human' and *pónos* for 'hard work' matched both the agroecological and self-contracting ambitions of the project.

(figure 33) **Non-organic ingredients for the ANTHROPONIX miniature foodloop**

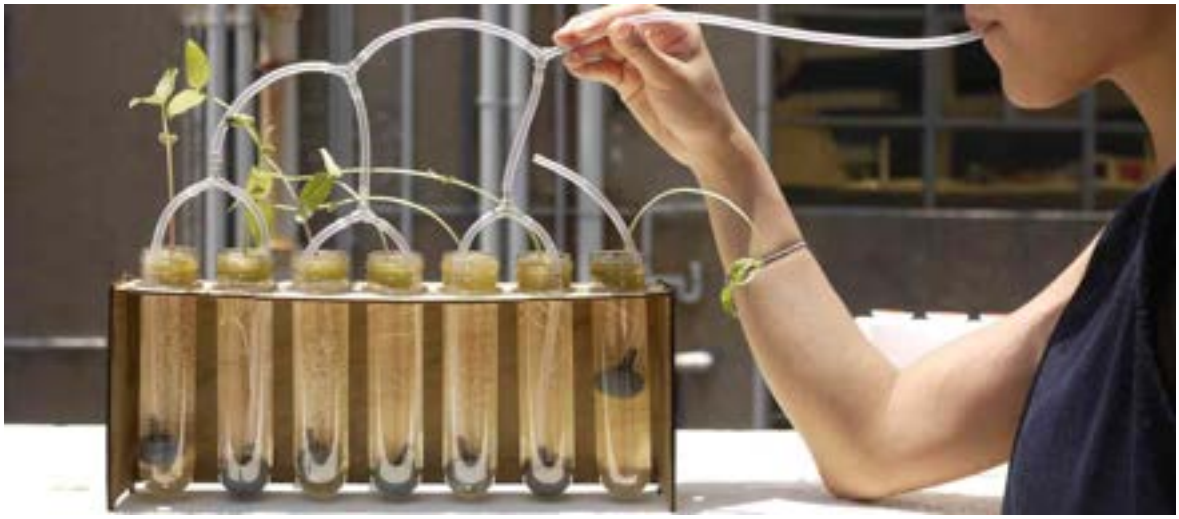
The social experiment explored the closing of the foodloop on the most basic level and on smallest possible scale for the space- and light-deprived urban home.

Wanted, ANTHROPONIX (人類水培) **Test Growers!** The study needed directivity. A description like 'scientifically guided, craftivist social experiment' was not really comprehensible for outsiders. Thus, participants were invited into a 'Citizen Science Open Call' for testing out a renewable hydroponics adopted for application in Hong Kong. The open call was distributed to everybody who encountered the Upcrafting Ventures and the Zero Organic 'Waste' Home. From there the invitation 'pollinated' onto Facebook pages and text messaging groups of friends, gardeners, and horticulture teachers. Candidates were promised to learn how to hygienise small quantities of their urine for raising plants without smell and trouble indicated in the contraption below (figure 34). The invitation also declared the study to be a 'special skill-up occasion' and an 'urban ecology adventure'. This could engender the sense of a common task worthy of one's dedication:

The five workshops are free of charge but full attendance is required to complete the growing cycle [Citizen Science Open Call]

The ‘urban ecology adventure’ seemed to strike a chord among plant lovers. Withing one week, close to 40 online application forms were lodged (see appendix), 35 intake interviews conducted, and the 22 most dedicated signed up to become ANTHROPONIX test growers. The core intention of the study was to observe how people change their eating and behaviour responses when they experience how the plants’ flourishing depends on the integrity of their urine. The intake interviews gravitated around the participants’ eating patterns, toilet regimes, and horticultural expertise. Participants were also asked to make a photographic inventory of the contents in their refrigerators and bodycare products in their bathrooms with the intention to compare potential changes in the course of the study.

(figure 34) **ANTHROPONIX contraption with lungs-infused aeration**



Planter module for growing vegetables out of urine specimen in 100ml tubes with airstones and piping for supplying essential oxygen to plant roots.

The ANTHROPONIX open call was not only setting demands on the participants’, it also had something on offer. The invitation featured a workshop curriculum listed below (table 8) that was structured around a specific focus for each of the five instalments. The biweekly Saturday afternoon sessions were dedicated to themes like Microorganisms & Urine, Seeds & Hydroponics, or Comparing Human & Plant Anatomy that informed every aspect presented in each the two-hour sessions.

(table 8) **ANTHROPONIX** (人類水培) **workshop curriculum** (Saturdays, 2:00-3:00 pm)

	1 April	8 April	22 April	29 April	13 May
Segments					
Missions	**Bacteria Power:** Learn how to ferment your urine from scratch	**Seed Birthing:** Learn the Anthroponic growing.	**Kidney-to-Plant:** Learn to keep your plants nourished.	**Plant Clinic:** Learn to diagnose nutrients deficiencies	**Did-it-Toghether:** Share your story in the photo gallery
Multilogues	**Essential Urine:** The potent biofuel	**ANTHROPONIX:** Renewable organic hydroponics.	**Plant Anatomy:** From chlorophyll to haemoglobin.	**Foodscaping:** Participatory urban metabolism.	**ANTHROPONIX 2.0:** Improve the next 'urban ecology adventure'.
Modules	ANTHROPONIX Kit Part I	ANTHROPONIX Kit Part II *Urine check-up*	ANTHROPONIX Kit Part III *Seed check-up*	ANTHROPONIX Kit Part IV *Seedling check-up*	ANTHROPONIX Kit Part V *Plantling check-up*

Curriculum preview featured on the Citizen Science Open Call that was a communal biopedagogic experiment with rudimentary technology.

Every workshop consisted of three 30-minute segments that interspersed activity with nonactivity, individual with group work, and conceptual with material exchanges. After an introductory reconnection exercise in the group, the 'Missions' segment was the learning-by-doing element for acquiring practical skills like making sauerkraut, using seeding plugs in water-based germination, or monitoring the growing solution. 'Multilogues' referred to the lecture part, illustrated by the slides below (figure 35), where the non-expert facilitators could only deliver hortitechnical concepts with concurrent input from more knowledgeable participants with bioscience or agricultural backgrounds. The 'Modules' part engaged participants with the devices of the shrink-wrap foodloop. Akin to the subscription model of a maker magazine with integrated assembly kit, the ANTHROPONIX contraptions consisted of five modular components that were handed out one session at a time. It necessitated for participants to attend every single workshop as to secure access the tools and materials for advancement. The 'Modules' segment concluded each workshop by integrating soft skill with hardware. Participants were asked to bring the material modules of the past week back for inspection for jointly evaluating the progress of urine fermentation, monitor constitution of the growing solution with hydroponic measuring instruments, and check on the development of plant life.

(figure 35) **Human and plant anatomy side-by-side in the 'Multilogues' lectures**

Sample slides of the Plant Anatomy lecture that correlated human with vegetal renewal in seed or embryo (left), and compares the exchange ecology of the plants root network with the communicative centre around the head of humans.

Most of the ANTHROPONIX activity took place at the participants' homes. Up to 14 days between workshops can seem an eternity – and a matter of life or death – when working with living materiality like urine, bacteria and plants. Readily available biopedagogic assistance needed to be in place. Participants agreed to join a text messaging group that ensured connectivity when urgent information was required. The biopedagogic self-tracking to monitor the shared human-plant flourishing proved to be a much larger challenge, because reliable biochemical testing is expensive. Laboratory urine analysis accounts for each single test substance separately—pharmaceutical, contaminant, or disease marker. With 20 participants, collecting 21 urine samples each (three weeks with seven days), testing just for a dozen different substances would amount to close to 5000 individual tests. Open-source bio-hacking tools[21] could not meet the study's requirements in regard to timing, scope or specification. Given these limitations, biopedagogic tracking at home had to rely on dipstick litmus testers for urine and plant solution as well as self-observation and journal keeping which is partially depicted in the following graphic (figure 36).

[21] The **DIY Desktop Spectrometry Kit** of the Public Lab (a non-profit, open source network for communal research tools) was considered for tracing a range of contaminants in urine and plants but was out of stock during study preparation: https://store.publiclab.org/collections/spectrometry

(figure 36) **The Journal of Mutual Flourishing**

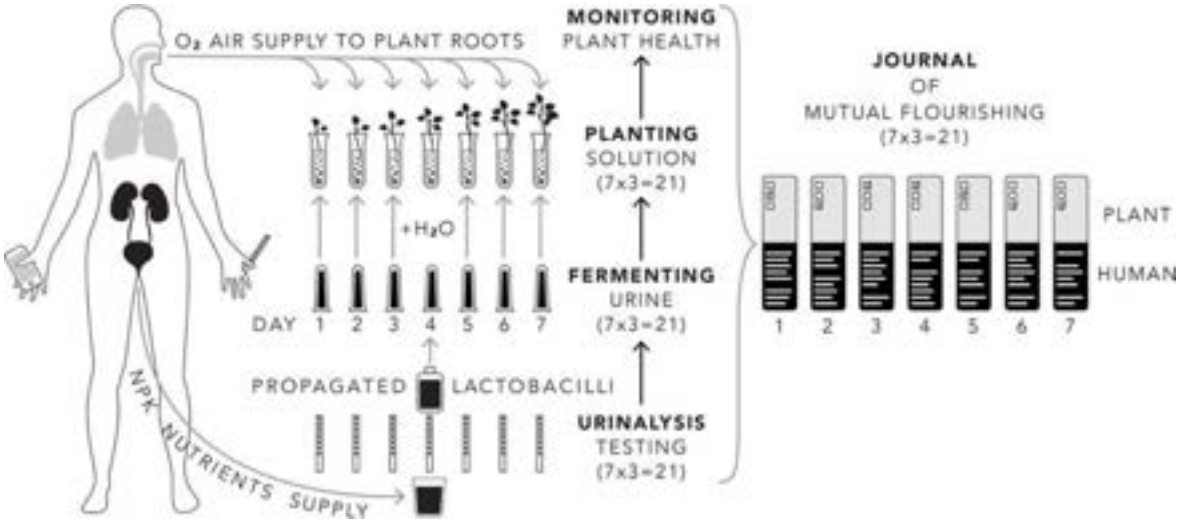
Detail of the journal's sleeve featuring a combined reference guide for body hydration status, urine analysis, planting solution monitoring and lactic acid bacteria propagation.

The Journal of Mutual Flourishing consisted of a sleeve (sized DIN A5) that contained 21 large sheets (unfolded sized DIN A2). The sleeve was designed as a visual reference guide for colour matching the results of the dip-stick testers, evaluating plant nutrients deficiencies (from the appearance of the leaves), and examining the progress of the urine fermentation. It also featured a urine colour chart to self-validate the state of bodily hydration and a ruler to measure plant growth. The journal sheets (see appendix) inside the sleeve traced the journey of each single urine specimen and prompted the participant to enter data and information through textual prompts, multiple choices, and phenomena charts. This way every urine specimen went on an annotated passage from human to plant life—including eating behaviours (Eating), psychosomatic factors (Bodycare), urine constitution (Urinalysis), fermented substrate (Culturing), fertiliser solution (Anthrotonic), and eventually resulting in plant growth (Growing).

At the first workshop on April Fools' Day, participants were instructed on how to collect urine similar to a medical health check. They were supposed to collect a small specimen from their very first urination event of the day because it is richest in nutrients. They also needed to collect midstream to catch the bacterially most sterile specimen. Participants were asked to urinate into a cup, insert the dip-stick tester, then pour a sample into a 20-millilitre centrifugal test tube and seal it. Every test tube was primed with 4-millilitres of propagated lactic acid bacilli from sauerkraut juice. After a couple of minutes the urine-soaked litmus pads on the dip-sticks had to be matched with the reference colours on the

sleeve to derive the value and enter it on the journal sheet. The daily routine of collecting, urine-analysing, fermenting, and journaling over 21 days was meant as biopedagogic routine indicated in the following flow chart (figure 37).

(figure 37) **Hortophilic ménagerie as an integrative biopedagogy**



A homemaking and consequential collaboration of humans in dialogue with their behaviour responses, bacteria and plants utilising human urine, exhaled air and ample nurture.

The ANTHROPONIX growing system was so basic, it lacked the automatized aeration mandatory in water-based planting. Thus, participants were supplied with piping and airstones to frequently breath air into the planter tubes. The preparations and outcomes of the ANTHROPONIX study have been summarised in a video documentary titled Growing Vulnerabilities[22] which supplements this thesis.

ANTHROPONIX intervened simultaneously in 22 individual routines and coordinated 22 households into a shared, explorative effort of agroecological flourishing. Such a joint domesticity intervention therefore can be described as hortophilic ménagerie. The next chapter outlines from participants' first-person account how these coordinated movements in this hortophilic mênagerie have played out.

[22] **Growing Vulnerabilities** is a 17-minute long video produced by Benson Law and is viewable online: https://vimeo.com/252093007

The video shows how the precarious ménagerie venture started from a design exercise – with laser cutting, printed forms, product boxes – and moved into a practical workshop which proved its limits and prompting intervention and improvements. Inherent in the experiment is the narrowing feedback loop toward zero nutrient availability where the human excretes surplus elements which diminishes the quality of the input. These issues can be addressed by redundancy, diversity and scale—or simply by adding one layer of abstraction, such as the upcycled urine is not a direct nutrient solution, but ingredient in a more complex mix.

1

Hortophilic Ménagerie

This chapter chronicles how the study unfolded based on participants' self-reported statements and articulations. The collaborative provotypes for upcycling other organic residues – introduced in the previous chapter – has informed the implementation of the small-group study ANTROPONIX（人類水培）. Participants were invited to a biopedagogic experiment for closing their personal nutrients cycle. Biopedagogy refers to the intention to link the wellbeing of humans biophysically with the prospering of plants.

In spring 2017, over a six-week period, 22 Hong Kong residents volunteered to capture and ferment small amounts of their urine from which to grow edible plants indoors. The prerequisite for participating was the shared enthusiasm for growing plants – hortiphilia – and integrating the personal household as primary site of experimentation. In French 'household' is referred to as *ménagerie*, where it not just refers to an isolated domestic situation but a collection of practices that cumulate into one unifying event. *Hortophilic ménagerie* [*23*] therefore describes a study that brought 22 plant-loving households temporarily into a joint homemaking exploration.

The major challenge in this *hortophilic* ménagerie was that the cherished plants never really grew. Instead they floundered or perished. Technically the study failed and two years of

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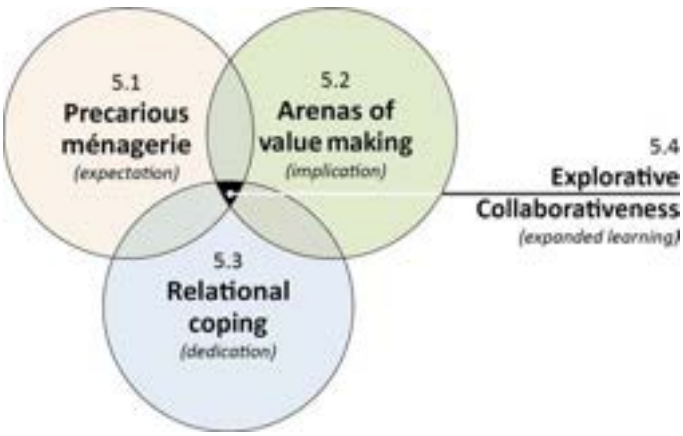
[*23*] **Hortophilic ménagerie:** Etymologically, ménagerie can be understood as a 'communal version of a domestic situation'. In French *ménage* means 'household': the appendix *-erie* expands this domesticity into an arrangement of shared interests. Historically, ménagerie referred to a migrating zoo that brought exotic animals to fairs or aristocratic establishments. In playful extension (leaving the colonialist problematic aside), ménagerie here refers to a collection of wild bacteria and the vegetal offspring from 'domesticated' urine.

Hortophilia – in extension of Edward Wilson's term 'biophilia' – has been coined by physician Oliver Sachs (Campbell & Wiesen, 2009:1) as the restorative craving in people for interacting with and tending to plants. *Hortophillic* ménagerie then is the desire of gardening, transformed into an entanglement of people and plants that can be captivating. Capturing urine for growing plants brings different ecologies in relation that are usually kept separate. Urine as metabolic product is a window to the mysterious inner ménagerie of our bodies. The same urine taken as personal plant fertiliser becomes a biopedagogic agent in the ménagerie with the surrounding world.

upcycling interventions could seem wasted. It completely undermined the original research intention of exploring biopedagogically how people would adapt their lifestyles in response to growing lettuce out of their urine. Yet, while the ménagerie failed the plants, it was able to captivate the human participants. All 22 participants stayed active for the entire 42-day period, some beyond that. The unintended question now was what dynamics made people stick to, and mostly enjoy such a precarious ménagerie.

Based on group interactions, observations and first-person accounts, this ethnographic evaluation reviews the participants' experiences to understand the process and issues that made the failing worthwhile to endure. It is unusual for busy, urban residents to invest their time, inventiveness and dedication into a project ridden with obstacles and little utility. This chapter looks beyond efficiency to explore the dynamics that helped participants adjust to adversity. As indicated in the Venn diagram below (figure 38), the first section of this chapter describes the developments taking place in participants' expectations as the study unfolded (5.1, Precarious ménagerie). The second section looks at the study's implications everyday life situations where participants had to make their engagement workable for themselves and close others (5.2, Arenas of value making). The third section focuses on the role of the in-group dynamics on perseverance and outlook of participants (5.3, Relational coping). In conclusion, the fourth section relates participants' intensive trouble-shooting passages back to educational literature on joint ability building (5.4, Explorative collaborativeness).

(figure 38) **Sections of ethnographic chapter Hortophilic Ménagerie**



The four sections of this ethnographic chapter review – from participants' self-declared statements – the factors that shaped their expectations (5.1), engagement (5.2), dedication (5.3) and learning outcomes (5.4).

5.1 · Precarious ménagerie

How can a venture without tangible outcomes generate value? Initially the shared quest for exploring a simple way of closing the personal foodloop was an attractive value proposition. When the venture was underdelivering – the lettuces, watercress and beans mostly floundered in the urine-enriched water solution – the perception of what makes participation worthwhile needed to adapt. The ménagerie turned from hortiphilic to precarious [*24*]: overcoming uncertainty (and the fate of this research) depended mostly on the perseverance of participants. How the ménagerie members made sense of the unfolding events and what they derived from the communal dynamics is correlated to understand what made this failing-in-togetherness more or less tolerable.

Already on *day one* of the ANTHROPONIX study the reality was more agitated than expected. For the first consecutive 21 days, participants collected tiny bits of morning urine – 'midstream' – in centrifugal test tubes. The *centrifugal* was assumed to contain the gases released during fermentation in the tubes that facilitators had ordered the week before the launch of study. Yet, the carbon dioxide of hardworking lactic acid bacteria was stronger than the centrifugal lids. When returning home in the evening on that first day, participants and facilitators alike, found infamous urine sample *Number 1* dispersed throughout their bathrooms. Only hours after the study began, the facilitators had to abandon all designers' pride and launch fearlessly into damage control: admitting the lack of preparation, giving explanations, imploring participants to tightly duct-tape the lids.

The exploding urine tubes on day one were a dramatic reminder how one was part of an experimentation prompting situations never encountered before. The participants were explicitly briefed at the intake interviews about the uncertainties this implied. In contrast, the study's professional organisation – including institutional backing, product design and well-structured tasks – could have given the impression how participating in this ménagerie is a controllable and easy affair.

[*24*] Precarity derives from Latin *precarius* for 'held through the favour of another'. Going beyond the meaning of uncertainty, it points to a deliberate social dependency that creates uncertain premises.

In the process of cleaning the mess of urine sample *Number 1* (figure 39) and presumably reassuring fellow household members, the realisation must have sank in that this study was not the *controlled* type of experimentation. Cella (28), a biologist, gardener and fermenter who had signed up enthusiastically, explained how she had to adjust her expectations from the very start.

> Initially I was thinking this was a Beta test, but early on I realised it was, what I call an *Alpha test*. I think at this stage, it is better to keep it flexible and open. Because actually it's not like a fully tested system. You are not establishing how it is supposed to work. You want people to try different things and then share what has worked best [Cella, exit interview].

Cella fittingly indicates how the study required participants to leave their comfort zone and put in extra effort, to make up for the imposed limitations. Improvising and communicating, was the need of the hour. To improve the outcome, participants had to contribute to the process rather than just partake. They were prompted to shift from participatory mode to collaborative learning. In recognition of this expanding commitment, participants henceforth are recognised as *collaborators*.

(figure 39) **One week worth of urine collection**

Study collaborator in her home bathroom presenting seven of her 21 fermented urine samples in centrifugal test tubes.

5.1.1 · Happy accidents and camp experience

The 22 collaborators contributed to this study predominantly at their own home through processing their urine and raising plants over 42 days. On five Saturday afternoons, the home-working collaborators would meet for a couple of hours at biweekly workshops. Collaborators lived in different parts of town and most did not know each other before the study. Coming from various sociocultural and biographical backgrounds, the group was made up equally of women and men. What brought these collaborators together was an interest in potentially growing plants from their own urine.

When the lids of urine tube Number one popped like champagne corks, the diverse collaborators were forged into one ménagerie. The urine blow-up was, in the words of co-facilitator Benson a "happy accident" [workshop two transcript]. The chemical reaction made the fermentation process and urine transformation palpable. Most importantly, it did *not* smell bad. The fermentation already had worked and was stabilising the urine. Since everybody encountered the same problem, it was the heightened moment of a group initiation. It led to a bonding that proved to be vital for bigger challenges still to come. The participant count remained at 22 on day two and throughout the study. Vincent (37), a musician who came into the study for seeking a more health-sensitive lifestyle, describes this group initiation as follows:

> Actually, it really is in the group where this works. It is a sense of some kind of common experience of overcoming common trouble. That's just nice [Vincent, exit interview].

The agitated, poorly contained fermenting bacteria were buffered in the group. With facilitators admitting mistakes and requesting help, collaborators became aware how everybody had entered unchartered territory together. Being pulled into such an ambiguous zone of not knowing implied two things: it blurred the roles and disciplines among collaborators, and it could trigger a continuum of learning. The ambiguous – what has never been encountered before – meant that facilitators had to relinquish a substantial degree of authority and engage more responsively with participants to maintain their goodwill—on which the advancement of the study relied. Such flattening of status can engender in the group a "feeling of shared ownership" (Muller, 2002). The ambiguous could also lead to a defamiliarized situation that required a flexibility of interpretation where collaborators are bound to "continuously assess the uncertainty" as long as it persisted (Bijker et al, 1987:44-

46). For people who expect consistency, such flexibility of interpretation can be stirring and demanding (Gaver et al, 2003). Yet, it is also the first step to self-initiated, extended learning.

The unintentional glitch was not the collaborators fault. Everybody faced the same problem and only by working together the problem could be overcome. Khai (57), a plant-loving social worker who came into the study because he is already growing hydroponically on his balcony, recalls his workaround for the urine explosions:

> All group members encountered this problem. I had no idea why it blew off. I followed your protocol and thought it should work. When the popping occurred, I thought some kind of chemical reaction must have occurred inside. And then I tried out many methods. Eventually a peer recommended to simply shake it, release the bubbles from the tubes (bzzz-bzzz-bzzz) and then put them aside. I tried that and then it was okay [Khai, exit interview].

Khai indicates how encountering the astonishing, triggered a mental state of not knowing, and social response. Psychological research indicates how ambiguous situations that occur accidentally (unknown probabilistic outcomes) can be conducive for individuals to engage in trust and cooperation (Vives & FeldmanHall, 2018). In contrast, premediated uncertainty (probabilistic outcomes) is likely considered deliberate risk-taking, which prevents people from acting prosocially and leads to self-centred decision-making. The urine explosions were considered an unresolved mishap that increased the tolerance toward ambiguity and the willingness to engage in substantial social behaviour.

> It was an experiment after all, and things do happen we cannot expect. In my group we discussed the gas leaking in detail and Nancy suggested to use special fermentation airlocks. We made a snap decision to buy a whole batch of these valves for all our members. This way we would not have to bother with the popping urine bottles anymore [Khai, exit interview].

Engaging with unpredictability is not a situation that can be permanently maintained. Clinical studies on collaborative dynamics indicate, how the link between tolerating uncertainty and prosocial motivation diminishes as soon as this ambiguity related to outside influence is sufficiently understood (ibid). Clemens (28) a self-taught gardener and permaculture practitioner came into the project to learn more about the biochemical aspect of the foodloop. He indicates how the joint desire to understand the cause of the problem motivated the cascade of troubleshooting.

> The group helps people to continue, because you know that what is failing, is not just your own problem. Everyone got the same problem and then it's actually good to see how people tried different ways to make to improve the system. That really makes me rethink the whole thing, because they have tried and I might not need to try the same way [Clemens, exit interview].

Soon after the urine tubes were taped down and the issue seemed resolved, more problems would arise. This chain of challenges in this unravelling of personal foodloop made it into what some collaborators called a "camp experience" [transcript workshop three]. There was a dysfunctional technical set-up, pressing demands, and conflicting directions that begged for perseverance. Camp experience here delineates how in mutually overcoming extraordinary circumstances – over a limited time – there was assertion found in the group. Engaging in collaboration was not just about improving the outcome, it was an end in itself. Several collaborators mentioned how the group work ultimately provided validation.

As a natural scientist, Cella (28) early on had to find personal justification for collaborating as *Alpha tester* in a scientifically uncontrollable experiment with infinite variables. Through broadmindedness she realised how value came from belonging to an unusual and enthusiastic group of collaborators.

> Actually, what I liked most, was to witness how the other people were excited. And to see that there are actually people in Hong Kong who are interested in fermenting their urine. That kind of blew my mind, because I thought that is impossible [Cella, exit interview].

Collaborators fermented their urine in relation to much larger goals that touched on health interactions, regenerative planting, 'waste' elimination, or self-sufficiency. Fermenting urine could be capacity building. Jyll (43), a community gardener and permaculture teacher joint the study to learn about agricultural fermentation. She describes how the camp experience was about facilitating an affective mentality.

> The group of people, I quite liked them, they were positive thinking people [laughing]. No one was saying, ah, this is a disaster! [Jyll, exit interview]

Jyll points to the group atmosphere that was anchored in a climate of respect and trust among peers and the authentic will to share. Positive thinking in a situation of tolerated uncertainty indicates how collaborators and facilitators were able to nurture enthusiasm and excitement. This positiveness was part of how peers in the group nurtured each other via

inspiration, mentorship or surprise. This potentiality from filling gaps that stirs self-inspired responses is referred to as “playing with the imperfect” (Gaver et al., 2003).

In relation to positiveness and nurture, Vincent indicates how polyphony and diversity in the group are important as well. Entering new territory together with similarly determined yet unfamiliar people creates an unusual situation. The discovery and repositioning of self in the transitioning social context contributes to an overall “affective atmosphere” (Cloke & Conradson, 2018) that can inform particular sensibilities of belonging, imagination, engagement and experimentation.

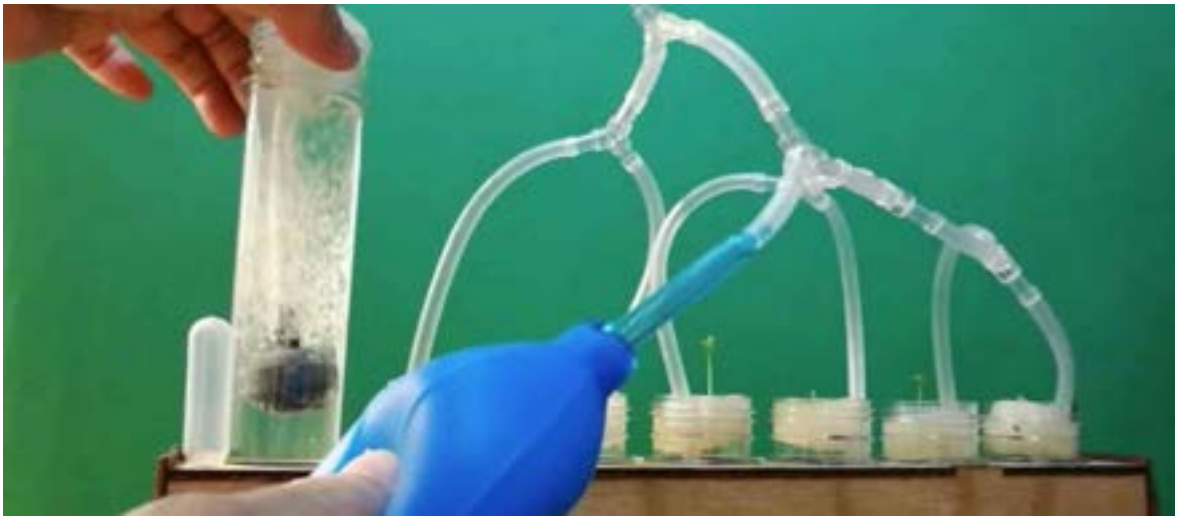
> It is totally great for me to be in such an eclectic group because otherwise I never had such people around me. This occasion brings them closer to me [Vincent, exit interview].

The affiliation with a polyphonic group constituted around particularised knowledge adds another dimension to the camp experience. Bjorn (57), a highschool teacher, signed on to the study because he was contemplating growing plants with a hydroponic system and hoping to learn the ropes. He found self-esteem from belonging to a group formulated around a unique purpose.

> In other workshops I wouldn’t be talking so openly about urine. Other friends I have told about this project had the yuck! factor. Then, I am doing something different, which I like because it sort of gives me little bit of notoriety [Bjorn, exit interview].

Collaborators were able to access value from working with the group for a variety of reasons. Positive attitudes stemmed from the invigorating diverse talent pool, a larger-than-self ambition or reputation bolstering. The study has captured a capacity for alternative ways of impromptu collaboration in response to uncommon issues like the aeration needs for plant roots as seen in next image (figure 40).

(figure 40) **Compensating for restrictive growing ecology with manual aeration**



Still frame from demo clip of handpump in action to aerate miniature urine-infused water planters [video still courtesy of the participant].

5.1.2 · Validation from shared concerns

When people collaborate they engage both for self-determined and interpersonal reasons. Collaborating with others may generate social value which often it is driven by individuals pursuing their personal goals and collaboration is a self-serving investment. All collaborators in the ménagerie were galvanised by the desire to engage personally in the wicked problem of a broken food system, many for their own reasons. The study outlined an approach to a problematic that was integrating the self-determined goals of individual collaborators. The dream of incorporating renewable fertiliser into compacted, indoor planting was resonating with the personal aspirations of many. Mike (44) who built his hydroponic system on the rooftop of his house joined the study because he was longing to substitute petrochemical nutrients with an organic input.

> Yeah, when you told me about this project, it was already something I was thinking about it. The missing part of the loop, really, with hydroponics. If you can solve that without having to keep fish alive, then great [Mike, exit interview].

The desire to expand her horticultural practice and learn about novel ways of raising plants was the central driver for Helga (48), an avid gardener. For her, the prospect of knowhow introduced by the international facilitators could be alluring. Collaborating in the experiment was the only way to find out.

> I really love plants and really wanted to know whether this type of growing can be applied in Hong Kong [Helga, exit interview].

Wilma (46), a soap maker and locavore revivalist mentioned her suspicion of how the study was doomed to fail—already before it had started. Closing the foodloop, without the capacities of soil bacteria or engineered solutions, seemed too improbable. Supposedly counter her own intuition she had enrolled to find out and be proven right. This willful engagement in actions against better is known as "akrasia" (Adler, 2002). Staying with the communal effort was about finding mental closure by witnessing what the results will be—if any.

> When I knew about your project, I was sure that the result is not good: so I joined! [laughing hard] I knew that this resource, maybe the proportion is very limited. I simply was interested in what would happen. Sorry, I still joined in... [Wilma, exit interview].

Aside from discreet suspicion, keeping a promise made to oneself was amplified in the group. When promises are broken it could signal to others that one is not trustworthy which can leave fissures in human relations. The can-do spirit affirms one's own self-worth since abandoning promises is essentially disrespectful of oneself. Titus (58) a retired realtor and passionate gardener, promised himself to fertilise his hydroponic balcony orchard from upcycled organic 'wastes'. His eagerness was such that he collaborated with facilitators for two extra months past the study period on technical improvements. It was about joining forces in a journey of trial and error that began for Titus already a couple of years earlier. In a matter of respect, he worked with the constraints of the given set-up before expanding the procedural experimentations on his own terms.

> This is not yet complete and I need to complete the project. I need to look at the plants, grow them up and eat them! I feel when we change the tiny watercress onto a sponge, we disturb the root or hurt the root. I prefer to do it in my way: put the plants in a stable environment and let them grow without disturbance. Because always changing the water and moving the plugs around is affecting the plant [Titus, exit interview].

Making the impossible possible was a self-promise that stirred personal determination. Eliza (24) a nursing student with profound interest in health-related human-environment interactions, was extremely keen to enter into a direct, metabolic exchange with plant life. She describes how after some initial doubt and setbacks, it came down to playful inventiveness which enabled her to accomplish the self-defined goal.

> At the beginning I thought this concept does work. And after that and during the project I think, maybe it doesn't work. But later on, I just changed the seed. The lettuce didn't work. The mung beans didn't work. I ended up using the soy beans and then the White Navy Beans. I just kept trying out with other seeds until I got something to grow. Look, they are so powerful the White Navy Beans! [Eliza, exit interview]

For Mike the study presented a welcome experimental opportunity that deserved full attention. Despite family commitments and long commute. He was a consistently proactive collaborator—until the technical limitations became evident toward the end of the study. Here the self-commitment of potentially attaining a breakthrough was grounded in the continuation of a self-declared trait.

> I don't quit, I never quit. If you quit you might miss out on potential learning opportunities. I definitely learnt something from the presentations you gave as well. The whole thing about leaf observation and root health issues was useful. If I hadn't come I would have missed that [Mike, exit interview].

For Nancy (48) a real estate professional, dedication was more a matter of carrying on her personal narrative. She perceived herself in the role of a diligent student. In her view the study represented a schooling that demanded attendance and ended up with an overload of homework.

> I didn't give up because I am doing self-study about design for planning and planting. I kept coming to your workshop because I made a promise, so I didn't think about if it is worth or not, I just went for it [Nancy, exit interview].

5.1.3 · Emergent learning

For Nancy, learning was a reactive experience by adhering closely to given structures, which were unstable in this experimentation. The precarious ménagerie was more inducive to spontaneous forms of learning as shown in next photograph (figure 41). Twenty-two collaborators along their household members brought diverse backgrounds and levels of expertise into the project over the six-week period. Aside from homes where most of personal efforts took place, the workshop series, text messaging group and the facilitators' office provided outlets for ad hoc knowledge exchange.

(figure 41) **Peer-to-peer exchanges on fermentive concepts behind sauerkraut**

Participant with food preservation expertise explaining fermentation principles of sauerkraut making to peers during first workshop (artisan instalment).

At the biweekly workshop series, instructions and discussions were purposefully kept open so that they could be redirected by collaborators since many were agroecologically more knowledgeable than facilitators. Sharing knowledge was a process encouraging peers to take learning into their own hands through exploratory avenues facilitated by the group. Oscar (39) an ecologist and educator, was very supportive throughout the study due to his professional dedication to 'waste' reduction. He indicates how explorative learning can stem from being with other learners bound to navigating the uncertainties.

> Content-wise I may have learnt very little from the project, but I think I learnt something since some people may think differently or make the whole project a richer experience. It is just these little tricks which others are applying that make a difference. I like to learn by seeing people doing different things [Oscar, exit interview].

Oscar speaks to the mutual learning (Jäppinen et al, 2016) that took place in an atmosphere conducive to transparency where collaborators partake in a shared struggle that can support the (re)evaluation of personal expertise. Observing and learning from each other was called for when the given instructions proved not viable anymore. The group involvement was also essential for the realisation that all involved are in charge of their own learning to diversify their trouble-shooting responses. Clemens mentions how he experienced this process of co-learning with peer expertise instead of a designated teacher.

> It is certainly good to bring in different people. Some have a hydroponic background and provide welcome suggestions. At the same time everyone is doing the same task and then people who don't stick to the rules actually seem to get the better results [Clemens, exit interview].

In this unreliable set-up a number of collaborators went beyond the given limitations by expanding or defying official directions. They followed their own intuition and tried variations. Changing the dosage of nutrients solution, simplifying procedures, reducing plant maintenance from daily to weekly, using larger planting containers, trying seed varieties until successful. Gradually, as the intended procedures and curriculum fell apart, the peers inevitably grew into co-learners or self-initiated mentors.

Felix (32) is a researcher of regenerative agriculture and instructore at an educational farm. Being well versed in nutrients conversion processes from his own fish-to-crop aquaponics practice, there was not much technical knowhow for him. During the study Felix took an introspective standpoint. By primarily listening to peer exchanges, he was intent not to interrupt others in their learning path as to gain pedagogical insight.

> Many people were very new to it the subject matter. It is interesting to see how they have interesting discoveries. So I try not to make any judgement or give them any comments because it is more gratifying for them to experience by themselves [Felix, exit interview].

The peer-led, emergent learning rooted in eclectic group dynamic was not accessible for each individual collaborator. The information-packed, turbulent workshops required inquisitiveness on the part of collaborators. Igor (23) a college student is considering a career in natural science. He pointed out how he was not comfortable to engage with peers with more expertise.

> As one of the younger participants, I didn't have much topics to talk about with older people. One reason is that they are seriously farming or really in the industry, while I am just a student. I don't have that much experience to keep up [Igor, exit interview].

Personal traits like introversion or sociocultural factors like seniority may have hampered learning in the large group during the workshops. Yet, in this communal experimentation much learning emerged outside the publicness of peer group. Most study activities took place in the familiarity and discretion of the collaborators' homes. Between the workshops collaborators were self-directed co-researchers.

5.2 · Three arenas of learning probabilities

The 22 collaborators were asked to reorganise their bathroom routines to accommodate urine collection, make space for indoor planting, report on their progress and get into exchanges with peers on five Saturday afternoons. This section compares the personal feedback with observable aspects of collaboration to trace how the study has affected the participant's life world. This section looks at the dimensions of direct involvement and the importance collaborators placed on them. It can indicate what made it personally valuable to endure ambiguous conditions. Integrating and adapting to ambiguity in the daily life of collaborators took place in three arenas of involvement in this study: artisan instalments, home ecologies and rapport ecologies.

5.2.1 · Artisan instalments

Spread out over the two-month period between intake and exit interviews, each collaborator was requested to attend five workshops, each lasting about two hours. These Saturday afternoons were the socio-material lifeblood of the study. Every session came with a focal topic and contained increments of knowledge, supplies and mutual support. The biweekly learning instalments were each linked into a cohesive curriculum. Inspired by the subscription model of assembly kits in maker culture magazines[25], collaborators were invited each time into a shared passage of discovery. Igor, who was uncomfortable with the group's expertise gap, appreciated the goal-bound structuring he got from the modular program:

> Every time there is some kind of presentation, some type of knowledge or skills, and something that we can take back home, like the equipment and things. I think it's interesting [Igor, exit interview].

Collaborators alluded to the modularised sessions as workshop, horticultural class, student union or ANTHROPONICS lab. The term 'artisan instalments' acknowledges and combines all these interpretations. *Artisan* here refers to the dedicated nurture of performative materiality constituted from horticultural exploration. *Instalment* – the sequencing of parts toward the completion of an effort – implies at the same time relational obligation and substantiating prospect. It is a sequence of upskilling events with knowhow, materials and

[25] The **GoBox Build-Your-Own Robot Kit** is a sample for a monthly subscription service that delivers monthly robotics missions with programming lessons to the customers door: https://www.dexterindustries.com/gobox-robot-subscription/

social backing. The artisan instalments held together an orchestrated plant nursing at 22 homes around town. Orchestrated nurture is not the same as centrally controlled. Orchestrated implies decision-making from expertise that is coordinated among many, rather than power exercised by a few. The artisan instalments were collaborative offerings with props and protocols from which collaborators could pick and choose, leave or take as they saw fit.

> It felt a bit like a student union to me. Ahm, yeah, because we were all adults and we could all make our own choices, and if somebody doesn't like it, he or she can do it differently [Cella, exit interview].

For Titus who was keen making water-based horticulture more ecological, the artisan instalments were about good company to get the job done. He described Cella's student union as a "friends' work group" [Titus, exit interview]. Helga mentions how such affinity in the artisan instalments stemmed from a positive, conversational quality.

> Fellow participants would ask questions and discuss issues together, so I felt that the atmosphere was very good. The gatherings were really good [Helga, exit interview].

Collaborators trying to get the plants growing at home were conscious about others struggling concurrently with similar issues. Everybody was encouraged to bring their urine ferment and plant babies for viewing and biochemical testing to each artisan instalment, as way of horticultural consultation.

> In every workshop I learnt a little bit more, then observe and trying to do something at home, then come back and interact with others about it [Jyll, exit interview].

Spreading the learning over six weeks in five artisan instalments also was meant to obligate into a durational effort. Many peers mentioned how personally showing up to all sessions was a significant commitment to make, also due to the cumbersome logistics of transporting plants and urine. Mike mentions the trade-off between the social and the procedural.

> It is always worth to bring people together and actually share things. You can't really replicate that online. I just think it was a hassle carrying stuff on the bus [Mike, exit interview].

The artisan instalments convened the entire group around one meeting table. At the start everybody received a short questionnaire and was asked to complete it with answers from

up to eight peers. This reportage exercise effectively initiated the flow of conversations among the diverse collaborators. The questionnaire was related to issues and sentiment that the preceeding week had presented. These peer-led inquiry helped introverted collaborators to break into the large group and to form smaller subgroups. Collaborators got into (in)direct interactions to learn about experiences and workarounds of others.

> I formed a little subgroup [laughing] with people I was more likely to talk to or exchange experiences with. I don't know what my role in this group was, for me everybody was equal [Cella, exit interview].

> Without any reason, I would not really go out and talk to anyone. But I really was listening to what they were saying. I know, I am a very good eavesdropper [Vincent, exit interview].

The artisan instalments made for what some peers called "accelerated learning" [transcript workshop five]. Problem solving derived from collaborators' self-reflection, articulation and quest for solutions. It was the peers who decided what was to be discussed. This mutual commitment to expertise development shifted the responsibility and agency from facilitators to collaborators. Most collaborators realised how the currency to learning was the direct involvement with each other.

> It is a quite fast learning experience because I could access various expertise and experiences. I am getting insights from others to about the intricacies of the process since initially I have no idea how to use the urine for planting. The most important is the direct interaction [Khai, exit interview].

Not all accelerated learning was provided through the collaborative peer-to-peer interaction. The facilitators had prepared short, topical slide presentations: on water-based planting, plant-human anatomy, 'first aid' for plants, and 'participatory urban metabolism'. By infusing the presentations with a certain sense of awe, the facilitators hoped to make the artisan instalments rewarding.

> I sort of pick up little stuff here and there, every week I come. Like the weird stuff, for example, that the plant roots need oxygen. It seems like that in this moment of my life, such kind of knowledge is something I am interested enough. So that made me coming back [Vincent, exit interview].

The majority of collaborators were native Cantonese speakers, and few were less comfortable communicating in English. The shared purpose and need for mutual

troubleshooting in a limited timeframe exposed collaborators like Bjorn into unfamiliar sociocultural territory, giving way to self-discovery.

> It was interesting speaking to people I would never normally speak to. And we got a common purpose for being there. So that's what our conversation can provide [Bjorn, exit interview].

For showcasing the efforts unfolding at homes, collaborators were asked all to document their planting experiments and submit the photos prior to the last session. The enlarged printouts of these self-documentations were displayed on the wall so that anecdotes from their individual journey could be shared in the plenum. After overcoming aversion for almost two months it gave collaborators an opportunity to contribute to a shared narrative.

> In the end, everybody was giving a little presentation, like two minutes, and telling from their own experience. They were happy that they could share their journey and that was a nice way to engage everybody [Cella, exit interview].

> The showings at the very end were revealing other people's approaches, how they improvised, modified and made things work [Mike, exit interview].

Some presented their hapless hortophillic journey with a fine sense of humour. Others documented their urine/plant contraptions as aesthetic still-lives or image sequences from the process undertaken. Many animated their presentations with tongue-in-cheek anecdotes. These concluding presentations (figure 42) provided a knowledge dividend that entailed stirring, surprise and inspiration (Jäppinen et al., 2016:327). Stirring came from the acknowledgement for the inventiveness displayed. Surprise stemmed from the enthusiasm that had outlasted and transcended the experience. Inspiration was indicator for the learning that had emerged.

(figure 42) **Adding to shared narrative at self-curated exhibition**

Final workshop with exhibition from participants' self-documentation where collaborators shared from their journey of urine-powered planting.

For Becky (22), a college student, the final presentations were evidently an inspiring comparison that put her own performance in relation to others'. It helped her recognise and self-validate her position in the larger context of the peer group.

> At the last workshop, I suddenly discovered the interesting bits about the project. Ever since I wanted to know how the roots, how the plants can be helped to grow. Because some peers actually managed to grow real plants [Becky, exit interview].

Becky had been discouraged by the serial floundering of her mung beans. With school exams in the middle of the study, she had soon resigned from the daily tasks. The peer presentations prompted a healthy spurring – regulating competitiveness – for reconstituting her position within the group. The week *after* the study had officially finished, Becky set out with seeding and planting again.

5.2.2 · Home ecologies

Most of the collaborators' efforts in this urine-to-plant upcycling study unfolded in their homes, day in and day out for six weeks as documented in the next photograph (figure 43). The agroecological homemaking tasks consisted of the 'urine work' (collecting, testing and fermenting), journal keeping and plant nursing. The intervening in homely arrangement involved material, spatial, and interpersonal aspects.

(figure 43) **ANTHROPONIX contraptions at collaborator's home**

All 21 tube planters lined up on the window sill of collaborator's living room in Kowloon City [photo courtesy of participant].

The contraptions of the shrink-wrap foodloop basically consisted of empty containers arranged into an alluring package: empty tubes for urine collection, empty vases for plant nurture, blank pages for journaling human/plant flourishing. The product design was both desirable and doomed. Cella (28) sums up eloquently how the ANTHROPONIX devices were a material launching pad for bringing focus and order into the exploration.

> It seems easy… like you can grow your own plants by collecting urine and water. And then off you go. I think that's like easy enough that people in Hong Kong think: 'oh, I give that a try, I don't need much space, I can hide it under my sink and do it' [Cella, exit interview].

The promising package came equipped with tester strips and reference charts for evaluating pH value, urine constitution, plant nutrients deficiency and DIY-instructions for urine fermentation. In the absence of professional lab testing, these analogue, non-digital self-tracking technologies were meant to lend the daily procedures a sense of direction.

> It is just like a protocol that you designed. Like steps and sequences. I mean that, in the least, it brings focus to someone who is totally clueless about this whole thing [Vincent, exit interview].

The contraptions expressions of a strategy for transforming what commonly is considered dirty into something desirable. In what Tony Fry refers to as "recoding design" (2018:47) the ecological and cultural aspects are brought into the personal experience to allow for a more

differentiated perspectives on ‘waste’. Collaborators often debated, if the *fermented urine* was still urine as in ‘waste’ or whether it had turned into something else.

> The design was amazing. It was fancy and beautiful. The urine became something else. It was much better than we assume in our regular perception. It is cleaner than what we thought before and its smell was not unpleasant. It was acceptable [Oscar, exit interview].

Recoding of urine through smell-curbing fermentation and clean design alone do not suffice. The facilitators’ thriftiness and overconfidence led to a systemic flaw that would make the plant growing into a gamble. In addition to untested centrifugal tubes, facilitators also risked downsizing the hydroponic planters in the last minute (to save money). Unfortunately this would push the nutrients-transforming bacteria beyond operational limits. Nutrients in urine need to be mineralised by oxygen-reliant bacteria before plants can utilize them. For alleviating suffocation in plants from nutrients overload (eutrophy), constant air injection was required. Yet, the tiny ecologies inside the planters were extremely unstable, making it finicky to grow lettuce, beans and watercress from home-fermented urine.

> It was way too dramatic. Whenever I put a drop of water, nutrients or whatever inside the planters I can see the results the next day. But it’s not looking good and I don’t know what to do when I see the result [Jyll, exit interview].

5.2.3 · Nudging routines

The flawed contraptions were still instrumental for implementing small changes in their day-to-day habits in and around bathrooms as shown in next photograph (figure 44). Change here was a matter of making time, remembering and accepting imperfection.

(figure 44) **Making place in the bathroom for curing urine**

ANTHROPONIX urine storage units (right side) on participant's bathroom floor [photo courtesy of participant].

Collaborators were asked to collect, test and ferment 20 millilitres of their morning urine – midstream – for three weeks. After fermentation, a lettuce or watercress seed was supposed to be grown separately in each of the resulting 21 urine ferment specimens that was diluted with water. For tracking how one's eating habits and emotional fluctuations would impact the urine-exposed plant life, an elaborate journal with multiple questions, forms and charts was provided. Vincent (37), a freelance musician, who works from home, had the flexibility to accommodate the daily tasks as triggers of minute change.

> Yeah, it seems just like a really small goal! This [urine collection and tracking] takes less than seven minutes of my day. It is a very small thing like this little seed where you start small [Vincent, exit interview].

Other collaborators with families, long commutes and packed working days, were so time-constrained that they had a hard time keeping pace with the urine tracking and planting procedures. Some time-pressed collaborators even were deprived from daylight which hampered the colour matching and evaluation of the urine test strips.

> During the week it's quite hard, finding time to do the testing, because I get up at six, I leave at quarter to seven. And when you get home it is usually not until dark so it is difficult, especially to do the test strips. Each time, I mean, it is 15 to 30 minutes to go through that whole process. Weekend is okay, I got more time, I can sit down, I can go through it [Mike, exit interview].

Some collaborators relied on their domestic workers on regularly changing the urine-infused nutrients solution and looking after the plants. Karmen (46) the director of a 'green life'

advocacy network was overwhelmed by the daily tasks. The study made her ponder what flourishing and quality of life could personally mean to her.

> I can observe how my life is too busy and I really want to slow down. I am aware that this is not green living. You make yourself so busy you cannot enjoy life. This project gives me a message that I really need to slow down, look after my health, my family and my lifestyle [Karmen, exit interview].

Nancy was between jobs and had time on hand to follow through with the tasks. She thought of the study as a welcome training opportunity in water-based planting. Since she wanted to obtain a commercial hydroponic growing system soon, so she was devoted to get her 21 mung beans growing. As instructed, she changed and aerated the nutrients solution in each planter every single day. This never-sufficient effort turned the tasks into a chore.

> This course was really time-consuming. Probably I used two to three hours per day… Yes, every day. Because I really wanted to change the nutrients water in all planters each day [Karmen, exit interview].

All collaborators agreed how the recurrent urine testing, daily nutrients swapping, air-blowing and seeding was frustrating. Unsurprisingly, after a couple weeks, many took a laissez-faire approach to the tedious regime and consolidated all nurturing activities into a weekly session. Cella [exit interview] indicated how she "took it easy" when the study's workload got too daunting, while some reduced the active task performance to suit their schedule, others accepted the demands for a limited period of time with the defined end in sight. Mike mentions how only an exceptional state can warrant such efforts and what sounds like accepting voluntary oppression in one's daily life.

> Yeah, just three weeks of it. By the third week, I was like, okay, enough of it… [Mike, exit interview].

Most collaborators endured this temporary imposition in their daily lives because they wanted to contribute to a positive outcome. The integration of new routines also confronted with cognitive matters like attention, unlearning, and accepting imperfection. Remembering – after getting out of bed – those extra steps for urine collection could pose a dilemma as Felix recalls.

> Just one day I forgot to collect the urine, the first thing in the morning. I don't know, maybe I was busy thinking about something else… And then I was thinking whether I go to pee and I forgot it again… [Felix, exit interview].

Collaborators were asked to collect a sample from their first urination of the day. But what happens when sleeping patterns are more irregular? In this non-clinical trial, collaborators were left to make ad hoc decisions when nature's call was stronger than the 'first thing in the morning' rule.

> Getting up in the morning and remembering to pee in the cup was a bit difficult. I didn't forget but it was a bit of a hassle the first thing in the morning. Also, if you get up in the middle of the night, do you go then or… what do you do? [Mike, exit interview].

Most daily routines are second nature and completed without any cognitive self-awareness. Breaking into and adapting toilet routines presented the conundrum of sequencing. A work flow for the urine tracking needed to be established between morning toilet and breakfast.

> After I am doing the urine testing in the washroom, I want to eat. So, after or during my breakfast, I work on the journal. But sometimes I forgot the test strip for a longer time, so it dried and the colours have changed… so I'm not sure about the results anymore [Clemens, exit interview].

Negotiating personal routines possibly stipulated momentary self-reflection on one's habits but was not disruptive enough to qualify for what Anthony Giddens refers to as "critical suspensions of routine" (Cohen, 2000:97). To be critical, such suspensions need to be more profound. In this study collaborators were primarily focused on achieving goals, preventing them from consciously considering their habitual responses to the issues on hand. When they failed to achieve such goals, the resistance to change habits easily set in. The study was demanding and limiting, which could leave in a sense of insufficiency.

> It did affect me, because every time I went for a pee, I felt a little bit guilty about, just letting it down the toilet. And I was thinking, well, the bit before and the bit after the sample, it's such a shame that it's going… This lucky little sample is gonna be fermented and treated like royalty, and tested, and listened to, and smelled and… [Bjorn, exit interview].

When collecting 20 millilitres urine per day for agroecological purpose, one can easily feel discouraged when the remaining still goes to waste. Yet, coming up short and feeling guilty about it may not be helpful. The feeling of guilt often has a paralysing impact in changing behaviour, especially in ecological endeavours like waste reduction (Miles, 2018). Guilt can lead people to believe that the efforts required are too hard to achieve. It can cause individuals to remain trapped in their own insufficiency. Guilt derives from falling short of being perfect or from lacking a flawless 'solution'.

5.2.3 · Spatial dispositions of urine reuse

Besides withholding 'lucky' urine samples from the sewer, the study also necessitated space-making efforts inside the home. Most collaborators lived in apartments shared with other occupants, thus 'spatial tactics' were needed to conduct the biopedagogic experiment. The needs of bacteria and plants, had to be balanced with the needs of household members. Concerns of usability, acceptance, and safety influenced the space allocation for urine collection units and planter boxes (figure 45). Since the props needed no electricity and plugs they could be freely 'domesticated' around the house.

(figure 45) **Urine up to the ceiling in the bedroom**

Urine storage atop closet in participant's bedroom to keep it safe from other household memebers [photo courtesy of participant].

The ANTHROPONIX urine collection unit was made of plastic, thus water-resistant. It consisted of three brick-sized tube holders requiring in total the space of one shoebox. For some collaborators, making space entailed going through a process of maximising and compacting the contraptions.

> Because I live together with my boyfriend and he doesn't like the fermentation stuff much. I first had it in the bathroom, kind of next to the toilet. And then I had it in the bathroom next to the sink, and then I moved it all under the sink and stacked the three packages a kind of on top of each other. This way they took up very little space and the lids couldn't fly away [Cella, exit interview].

Bathrooms in Hong Kong can be contested spaces. In some apartments, closet-sized lavatories come as combined toilet-shower configuration, fully tiled wet room. Often there is

no separation between washing and evacuating fixtures. This may explain why some collaborators resorted to finding space for the urine storage units *outside* their bathroom.

> My parents asked me why I need to store the urine in the living room. The bathroom was simply too wet and too tight, so it was untidy there. Then I cleaned the package, tidied it up and put it in our living room. Now I have a cup where I collect the urine tubes because it saves space. I think it's okay because in mainland China they also mix urine to the water for growing vegetables [Becky, exit interview].

Most likely not all collaborators referenced traditional agroecological practices to justify why urine should be stored in the living room. One collaborator reportedly found acceptance (or mom's blessing in disguise) by minimising the footprint of the three urine collection units by dispersing them around the house.

> My mom was tolerant enough to let me put the urine all over the house. It is now in the living room and on the balcony because there is not enough space in the bathroom [Igor, exit interview].

Where housing facilities permitted, some collaborators kept the urine entirely in the exterior of the household. That may have shifted unwanted encounters from fellow humans to other domesticated cohabitants.

> The urine is not in the bathroom, I put it in the backyard. I have a backyard and then I put it into the open area. My wife does not get there and I have only six cats coming into this area [Khai, exit interview].

The urine collection units were best stored in a dry and dark place most conducive to promote growth of lactic acid bacteria. Plant life in contrast requires sufficient light to grow. Even though the minimal luminary requirements were made explicit prior to the study, it was a tall order. Natural indoor light can be a precious resource in a densely built city.

> Our apartment is not tiny, but spaces with enough sunlight are very limited and usually it got already some plants there. [Vincent, exit interview]
>
> The challenge was finding the space where the plants can grow. I don't want to take up too much space because it is also our living space [Cella, exit interview].

Unlike Vincent and Cella, Eliza who also reside in a downtown neighbourhood, was able to escape the light-deprived confinement of indoor growing. She stationed her planters on a semi-extertior location. Although she had secured ample sunlight for her vegetal offspring it was now exposed to other airborne agents.

> I keep the planters and seeding napkin outside my window on top of the air conditioner box. It means that when the typhoon is coming, I need to move them inside. I know that

> some birds always hang out there. Sometimes they even come into my room. One day the seeds had disappeared and I don't know why. Maybe some birds picked them? [Eliza, exit interview].

The missing seeds were easily replaced and fortunately no typhoon made landfall during the study. For Becky who is living in a tower block, orbiting the planters in tune with circadian rhythms of her mung beans became a constant – possibly enjoyable – routine.

> I observed the sunlight in relation to the mung beans in the morning and evening. And interestingly the leaves keep turning to the sun. Then I kept moving the planters around the living room so that the leaves can access the sun from different directions [Becky, exit interview].

Circumventing light-deprivation led to other inventive forms of nomadic plant growing. Titus was concerned with boosting performance in his plants. He put his water spinach on photosynthesising mode around the clock by combining natural with artificial light sources.

> When I put the plants near my window they get sunshine only in the morning. In the afternoon they are in the shade. At night I put them inside the household shrine near the fish aquarium where I can turn on the grow light. Actually, someone told me I should let the plants rest and get them some sleep [Titus, exit interview].

Not all light-deprived collaborators turned their plants into objects of spiritual devotion. Some evacuated their plants from unwanted attention. For Felix, a young father, living with his toddler, wife and in-laws in a small apartment, exiling the planting contraptions to his workplace was the preferred option.

> For me the hardest thing was to do the growing part at home. I have to consider it is out of reach for my daughter, have to get enough sunlight and I am not affecting others. Actually, I don't have that space so I took the planters to the farm where I am working [Felix, exit interview].

5.2.4 · Home relations

Felix describes how integrating this intervention in daily life was foremost guided by the convenience concerns for loved ones. Making space for urine and finding light for plants was inextricably part of social context with close others—family, neighbours, and pets (figure 46).

(figure 46) **Wayfaring intervention with household members**

Participants negotiated with their fellow inhabitants space and routines around the intervention: Watercress in the living room under feline inspection. [photo courtesy of participant].

The home is perceived as a guarded world for self-nurture, reclusion, withdrawal and privacy. This can make it an unlikely place for intrusive experimentations with routine and popping urine. Some collaborators were single occupants and indicated how this homely solitude made participation easier. It gave them more confidence to pursue the experiment without interrupting others. Clemens was relieved about the absence of his parents during urine collection period.

> I was the only one at home and that actually is much easier for me. If I have to stay with other people it would be much difficult because it takes time, you have to collect urine, and then actually everyone is waiting for the washroom [Clemens, exit interview].

Interfering with morning routines of close others was one concern. Maintaining peace of mind while conducting the (secret) mission was another. Many kept a low profile, so others in their household would be unaware of their undercover experiments.

> I won't tell my in-laws because it is just quite hard to make them comprehend the whole story. It is better that I experience the whole experiment and then I tell them the whole story, what happened. Because first I have to know what I have to go through,

> before I can tell them anything [Felix, exit interview].

In some cases the secret mission was difficult to conceal. The overreacting lactic acid bacteria brought inevitable visibility and olfactory sensation to the shared bathrooms and unsuspecting loved ones. In the family context the 'happy accident' was an actual accident.

> It wasn't overly smelly but a little bit and I got a few comments from my wife and it was alright. I mean we got used to it [Mike, exit interview].

For possibly making urine recycling into value proposition for sensitive family members and friends, it was not enough to prevent it from reeking. It needed to have a demonstrable purpose.

> My brother and my parents said nothing about the urine because there was no smell: I tied up all the tubes and put them tidily inside a plastic bag. My family would also ask why I am planting so many mung beans. But after a few days they can see that it is decorative and beautiful and they can accept this… I told my friends that I store my urine and they ask me: 'What? Why would you store your urine at home?' Then I tell them how I am using the urine for planting and their opinion changes: 'Wow, it's possible to grow plants with urine?' [Becky, exit interview].

For some, justifying the experiment was about building inner strength. In such self-coherent declaration, collaborators integrate their body-derived fertiliser into their own narrative. In telling others about the study, the use of urine could seem like a standard requisite in domestic horticulture.

> My wife doesn't bother with my experiments because she knows, I am doing this as my planting practice. I already mentioned that I joined this experiment and she knows my process. I think she support this [Khai, exit interview].

The keepers of indoor urine had a greater challenge. For the outsider who rebukes human 'waste', it is difficult to discern raw urine from the stabilised kind and it remained a vexed substance.

> I explained to my parents: 'this is not urine anymore, this is the plant solution.' But they would not buy into it (laughing). […] My entire family tells me to keep the stuff solely in my room and nowhere else [laughing]. They are just afraid of the urine. It is not related to smell. They just have the perception that this is dirty and not suitable to store indoors. Actually, I believe this urine is sterile [Eliza, exit interview].

Eliza's initial argumentation was not persuasive enough for her family. Yet, the objections apparently fed into the collaborator's narrative of being and doing things differently around the house. Through confidence and enthusiasm the self-declared mission was to

demonstrate how the urine has not only transformed but also carried transformative powers.

> At the beginning they think that I am crazy. And after I show them some leaves or plants that grow successfully in the tubes, I find that their attitude has changed. They now can take it for what it is: a simple plant in my house without any negative image. They can see the growing leaves and they realise, it is not just an experiment about the urine alone. I think working toward such a result is an important point [Eliza, exit interview].

In the various conversations with the facilitators, Eliza indicated how fascinated she was to enter the living exchange between herself, daily life and environment. She realised that urine could be the crucial link in this. That made her experiment ceaselessly with seed varieties until she found a species that would prosper in the inferior system. Making real plants grow out of her urine solution was her redemption. It made urine maybe a bit more acceptable to her parents, yet certainly it constituted her success story.

The urine contention took on a different trajectory between Igor and his mother. Rather than promoting urine as planting resource or self-discovery, here urine was part of an intra-family power dynamic.

> I explained to my mom that it has been fermented and is not urine anymore. Nonetheless she would always complain so I started to make fun of her. When I do the urine diluting, she believes it is dirty and tries to stay away from me. So I would just go after her. I asked my mom to help me *blow the plants* when she had time but it was just too disgusting for her [Igor, exit interview].

“Blowing the plants” refers to exhaling air through aquarium tubing into the water solution that contains traces of fermented urine. Since plant roots need to be constantly aerated for nutrients absorption, collaborators were asked to blow air as often as possible.

> My nephew told me: ‘this is your wee-wee!’ And I tell him, ‘no, this is not wee-wee’, because I really believe that. Then he just tried to blow into the urine solution… But he is only four years old, and he doesn’t know how to blow, so he actually just sucked on it… After that I am just like, okay, we just go and rinse him off. He thinks it’s just like juice [Eliza, exit interview].

Mike also tried to involve his eight year old daughter in the study since she already helps out in dad’s hydroponic salad growing operation on the rooftop. This was a father’s effort to raise the appreciation in his child for what it actually takes to grow food.

> My daughter knows what I have been doing with the experiments, and I had her smell the tubes after the fermentation process was complete. Yeah, she was involved and she helps with the planting as well. She is alright and quite cool with it [Mike, exit interview].

The mouth-to-plant air infusion was for many either too suspect or time-consuming. To circumvent this chore some connected the electric airpumps from their fish aquarium to the system. The unresolved aeration issue touched the inventive nerve of Teresa (58) and her husband who obtained a computer handpump to ease the job. They made a short video of the aeration-enhancing device in action and published it on the messaging group that triggered discussions with other collaborators, and leaving a sense of accomplishment in the couple.

> Yes, we are innovative, yeah, because we worked in advertising before, so we are creative [Teresa, exit interview].

The serial perishing of plants also prompted compassion among some family members. When Helga the veteran gardener, invited the facilitators to her home to conduct the exit interview, her son Ralph (19) reported how touched he was to witness the hortophillic struggle of his mom.

> I ask my mom, how the experiment is going, and then she said: 'oh my god, some of the plants are dying!' And I am like: 'ah, really?' I saw that some of the plants look really healthy and are growing up. But some of them just lay down and cannot grow. I can see she is like really sad because she really loves plants [Ralph, exit interview of Helga].

Helga and Ralph live on the 36th floor of a tower block and every available space in the three-bedroom flat is populated with plants. Ralph explained how normally he is not involved in his mom's plant-growing activities but the study has changed that.

> Every time I see my mom is blowing some bubbles in there, I am like, oh mom, what is that? And she is like, it is my urine. And I am like, okay, it's just urine [Ralph, exit interview Helga].

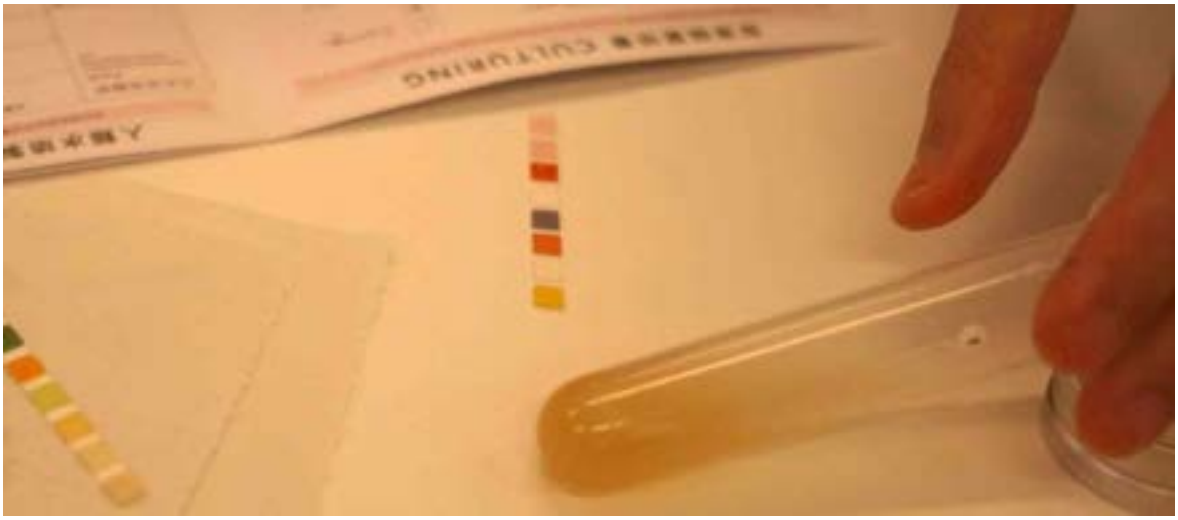
Most of the value creation came from the collecting, testing and monitoring of urine as biological health marker. Going beyond the instrumentality of nutrients capture, urine is an personal and complex biological substance, thereby was the locus for engaging in a conscious dialogue with oneself.

5.2.5 · Biopedagogical readings

Adding relevance to the Journal of Mutual Flourishing (see appendix), dye indicator strips for testing the biochemical constitution of urine were provided. These low-tech “biopedagogic devices” (Lupton & Maslen, 2018) were meant to track the health states of collaborators’ bodies, in co-relation to the nascent plants. The biometric tests relied on the judgement of the naked eye, therefore were less about monitoring results and more about honing self-observation.

The Urinalysis strips (figure 47) featured dye-indicators for eleven reagents, including glucose, bilirubin, nitrite, protein, leukocytes, pH, specific gravity and blood. The test strips are dipped into a cup with fresh urine. After half two minutes, each of the dye-indicators needed to be interpreted by matching to the colours on the colour chart indicating the values.

(figure 47) **Urinalysis elevates urine into a biopedagogic agent**



The Urinalysis die tester stripes required colour matching to monitor eleven different medical features like protein, nitrites, glucose and pH for recording in the Journal of Mutual Flourishing.

The flourishing journal contained 21 sheets for documenting dietary intake and bodily condition, and for relating the urine output with health indicators of the plants growing from urine. The journal combined project diary, food log and personal growth planner. These unified, biopedagogic package was able to mobilise participants:

> It is very personal. It connects them with their bodies, they were like very carefully observing their urine testing results and thinking, oh, you know, is my body healthy or not. Everybody wants to be healthy and that is like a big motivation to test themselves, am I healthy or not [Cella, exit interview].

The analogue tracking worked in tandem with the bodily sensorium to constitute knowledge. This interexistent meaning-making gave importance both to dietary input and out, so improving thriving for body and plants could provide a double motivation.

> I think, oh, I am eating this junk food which is not healthy to myself, then I really feel uncomfortable. So I want to change. I also want to look out whether any changes or negligence have any influence on the plants [Eliza, exit interview].

Based on subjective judgement, Urinalysis is a crude self-care instrument. Changing daylight conditions, fluctuations in perception and inconsistent waiting time entail many variables. Many collaborators reported how indistinguishable and repetitive the test values became. Some of the more senior study members felt too controlled and feared that elevated glucose values are linked to diabetes—they were assured how single indicators do not constitute a proper diagnosis. Despite misreadings and repetitiveness, also hopes and aspirations went into the urine testing.

> I was keen on this and I got accustomed to recording my urine readings. First, in the beginning it was hard to identify and match the colours. However, after a few times I accomplished it faster. Often the results were the same but sometimes I can see the indicators that may be affected by the food I ate [Khai, exit interview].

Collaborators felt satisfaction, even a kind of excitement or sense of achievement when perceiving a correlation for example, between elevated values of Specific Gravity or Leukocytes after a night of binge drinking. These affective dynamics were linked to the collaborators inclination for self-examining the inner workings of their body (Lupton, 2018). Due to uncontrollable planting conditions, the biophysical tracking of plant health was much trickier.

> I think it was useful for me to analyse my inputs and outputs. Seeing the connections between my output and the plants was a bit more difficult. In the planting part there were so many variables, it's just scary, so many variables [Mike, exit interview].

Each individual was free to decide how much they wanted to indulge with journaling. The 'Eating' section accounted for the social, spatial and psychosomatic factors that influenced the food intake. The 'Bodycare' section asked to make an inventory of sleeping patterns, application of bodycare products, physical exercise and trace daily emotional fluctuations on

a mood chart. For nursing student Eliza, surveying human-environment health interactions was welcome impetus.

> I am very interested in the direct linkage of emotion and diet. The sleeping pattern, the stress levels, as well as the diet are very important to the quality of my urine. I find that pH level or the characterisation of urine resulting from such negative factors may actually harm the plants. They died quickly after I ate unhealthy foods [Eliza, exit interviews].

During the first workshop, collaborators were introduced to the procedures of urine collection, testing and fermenting through a live demonstration by the facilitators. Seemingly simple instructions could easily lead to misinterpretations and misreadings in the bathroom.

> Oh, at the beginning, I got the Urinalysis strip around the wrong way (laughing). It was relatively obvious at the end. And some of the colours were really difficult to match anyway [Mike, exit interview].
>
> Because the results of the test stripes seemed sometimes a bit random, I felt that I could better rely more on my senses than the test stripes [Cella, exit interview].
>
> On the sleeve of the journal you have a row for 'normal' of the urine test values. Initially that was very alerting. But later on, I feel more like, well, I don't need this strip to tell me if I am okay or not [Vincent, exit interview].

The unreliable biopedagogic tracking drew attention to the limitations of such devices. It also reinvigorated the collaborators' confidence in the capabilities of their own bodily sensorium. In addition to the infamous Urinalysis colour matching, the biopedagogic evaluations tried to engage collaborator's olfactory faculties. Each sheet in the flourishing journal featured a dial chart partially displayed in the next photograph (figure 48) for describing the scent of the fermented urine.

(figure 48) **Aroma chart for olfactory evaluation of urine ferment**

The Journal of Mutual Flourishing featured a smell chart for olfactory monitoring of the urine ferment inspired by sommelier practice.

Infused with a small amount of propagated lactic acid bacteria, fresh urine is fermentable in airtight containers and will acidify – thereby stabilise – in three weeks (Andreev et al., 2017). Successfully fermented urine smells not unlike vinegar. Collaborators were asked to judge the fermentive progress for each of their 21 urine specimens through odour definition. The respective aroma chart contained 24 odour options that ranged from ‘enzymatic’ to ‘acidy’ and ‘distilled’. Acquiring this olfactory language was challenging.

> I found it quiet hard to fill in this part with the scent chart. I couldn’t smell all these nuances, I could only sniff out if it was fermented or not [Felix, exit interview].

Unlike colour hues, smells are notoriously difficult to put in words (Miller, 2014). Psycho-neurological research indicates a profound communication disconnect between the olfactory and language systems in the brain — particularly in people not fluent in indigenous languages (Olofsson and Wilson, 2018). This neurological deficit for verbalising smells may not be inevitable though. Collaborators fluent in bathroom readings (detecting olfactory variants in bowel movements) apparently had an edge.

> Ah, I love this aroma chart! First, I thought that all the urine has the same acidic scent related to the fermentation. But actually it was very fruitful to go deeper and identify different kinds of nuances. This way I find the linkage to the food I ate. There are significant differences in sweetness and sourness. Some is a little bit more bitter, or a little bit more salty. After I consumed fatty food, I think the smell is related to a more nutty kind of smell. Before the project I never thought I could detect such nuances in the scent of urine [Eliza, exit interview].

Collaborators were told that they could opt out from the given format, and utilise the blank reverse sides of the journaling sheets or any other, preferred way of recording. Most collaborators tried to conform but soon felt too controlled, even annoyed by the repetiveness of testing, reading, note-taking.

> Day by day, day in, day out. After the first week, the records got briefer and briefer (laughing). Because it repeats and repeats again. Also because Hong Kong people are very busy. So only the very first days are very detailed [Khai, exit interview].

Paper-based journal writing could be too restrictive for some. Two collaborators resorted to journaling with a digital spreadsheet or online calendar in an attempt to save time and gain more flexibility.

> After a few days I started to write it online on my laptop because it was just easier. It is just easier so I can do it on the go [Mike, exit interview].

During a workshop Titus revealed the impossibility of tracing the origins and integrity of hundreds of ingredients in a lavish Chinese banquet [transcript workshop two]. Possibly more rewarding was the journal keeping routine when it was detached from biometrics and was open to dimensions of personal experience, conduct and ethical reasoning.

> The cool thing with this journal is that it starts your imagination, like a lot of the content of this project for me. And then it really helps for me to kind of very lightly reflect on what I did yesterday [Vincent, exit interview].

Potentially the journaling routine helped make aware how personally closing the foodloop is not simply about capturing resources for crop production and soil stewardship. Human 'waste' could imaginably be reframed as a kind of personal memory carrier – a bioresidual time capsule – essential in re-*membering* how the self plays a vital part in a dynamic continuum of life. At least for one collaborator, the journal inspired reflection on what the larger implications could be when we are actively re-*membering* the human role in these circulations of life energy.

> I always wondered, what from my fermentation goes through me and into my urine. I am eating all kinds of fermented foods… so what is coming out? [Bjorn, exit interview].

The biopedagogic exchanges in this study played out in different degrees of publicness, from the withdrawn privacy of the home, to the closeness of one-on-one conversations with facilitators, to the more public spheres of artisan instalments and the digital messaging

group. The text messaging app proved helpful to keep the momentum going between the workshops and provided a sense of belonging for collaborators.

Through the anecdotal vignettes, the affective capacities and agency related to the spheres between self and group were reviewed. Even though the technical performance of the study was sub-par, it engendered social muscles and personal resolve that made collaborators stay on. The following section scrutinises the supportive dynamics that collaborators deemed important for overcoming obstacles in this experimentation.

5.3 · Relational coping

An adverse combination of out-of-season plant seeds, down-scaled planter size, and insufficient aeration of growing solution, made it (almost) impossible to grow lettuce, mung beans, and watercress from seeds. The facilitators had to accept the shortcomings of their design. The limitations opened for many collaborators an opportunity to intervene, improvise or appropriate the given system. At large, collaborators stayed engaged through crises and displayed resourcefulness in their responses to rescue their floundering plants. Proactive collaborators systematically germinated seed varieties, researched ways to improve the nutrients solution, or went as far as substituting the urine fertiliser with the synthetic option save their stunted plants from starvation.

5.3.1 · Makes process up for lack of result?

While all collaborators knew beforehand about the experimental character of the study, disappointment was sinking in when plants kept faltering. After investing much effort and hope, process alone without substantial result could seem wasteful. Wilma, an accomplished gardener, who hoped to acquire novel farming intelligence, appeared to have relinquished the study from midpoint when the horticultural underperformance became evident. Missing the last two workshops and ignoring reconnecting attempts, the facilitators implored her to return for the exit interview for venting her critique. When she finally granted the request she had one buring question:

> I have to ask one question first. What was your project about? […] Ah, was it learning? Oh, then don't worry about it. Oh, learning is trial and error. Because your scientific knowledge is very basic. You are a designer, not a farmer [Wilma, exit interview].

Many collaborators shared the sentiment of how constant failing without concrete outcome is simply not tenable. The study ended and left many – including the facilitators – with a deep feeling of unsuccessfulness after so much effort invested.

> I think it is difficult to get really good results, and there is a chance that people will be disappointed [Cella, exit interview].
>
> You just don't know why the plants didn't grow well, that's quite frustrating [Igor, exit interview].
>
> I got the strong feeling of being unsuccessful. Yeah, I was not successful in growing the plants because they always died. I wanted to improve but didn't know how to improve. [Nancy, exit interview]
>
> If I am putting this much effort into it, I really want to be eating what I am growing. Not just experimenting and playing with this [Bjorn, exit interview].

In the spirit of making amends, Wilma arrived at the exit interview equipped with instruction books and her laptop full of inspiration for improving the growing system. She had funnelled her fruitless planting attempts into a teaching moment for facilitators. They were extremely grateful for the technical pointers to be incorporated into future horticultural improvements of the system. For Wilma the intervention may have provided a sense of accomplishment and a *late win* for the overall cause.

Collaborators able to realise *early wins* – the sense of self-realised advancement – had it easier to stay engaged on crisis point. Aspects like, *not* following the facilitators' directions (and faring better); intervening in lecture with better translations of concepts (when the interpreter was clueless); researching on one's own terms (when the given explanations wer insufficient); or indulging in a humourous group moment (when faced with a serious subject matter), has attributed to such 'early wins'. When outward results were irritatingly absent, reaching out helped collaborators to find significance in the tasks on hand.

> Usually we don't see plants really growing. But this time I found when I germinate in the little cup… it is just a strong feeling that a little seed can really grow like that and amazing what life is. I think the most important is that I feel a connection with the plant. Even though I don't spend the time for the poor babies [Karmen, exit interview].

The conversations among collaborators and facilitators set the arena for framing, uncovering and articulating routine occurrences that otherwise could easily fall by the wayside. Revelations stemming from self-observations in context of subtle defamiliarization is known as *ostranenie* (Shklovsky, 1965), and can endow the process with new purpose in absence of results.

> Ah, one thing is interesting. If you pee into a small cup, the colour is different from when you pee into the toilet. Because it dilutes in the toilet. So you can't really tell what colour your pee is without using a cup. So without observing the cup, I won't know what colour my urine really is [Clemens, exit interview].

In the latter part of the study, the fermented urine was diluted in water to constitute the growing solution. To supplement the urinal nutrients with trace minerals, seaweed powder was added with a hint of smell. Eliza with her fine nose felt insecure about the solution's whiff and was swift to contact the facilitator for a rendition.

> You [the facilitator] replied and said that the solution has an 'earthy' smell, and after that I believe you. It changed my perception. Actually, I didn't mind the smell, it didn't really disturb me. I was just concerned and not sure what the smell was about. I was afraid only that it might hurt the plants, not myself. So when you told me, this is a normal situation, then I can accept that [Eliza, exit interview].

Finding a common language in moments of apprehension assists in normalising the situation since mental closure is attained. This finding-through-dialogue contributed to support and shared coping. These backup exchanges were part of a collaborative, synergetic effort that gave relevance to participants' ideas, expertise and efforts.

5.3.2 · Acute collaboration

Meant as prolific miniature foodloop and human-environment health interactions, the study became grit and shared struggle. Design had failed at shielding collaborators from the unpredictabilities of experimentation, instead they were prodded to grow on them. The word 'acute' derives from the Latin word *acūtus* for 'sharpening'. Acute collaboration meant that the precariousness in the study's ménagerie brought responsibility and resolution to activities in the group. Many collaborators complimented the holistic take of the study that interlocked collaborative investigation, critical evaluation, and ambiguous technology to explore concrete, communal approaches to a wicked problem.

> I can feel you [the facilitators] put significant effort into bringing our daily lives together with plant lives… it makes us aware that our own lifestyle can affect the plants [Karmen, exit interview].

The middle part of each workshop featured 20-minute, topical presentations titled: 'Urine as Biofuel', 'Renewable Hydroponics', 'From Chlorophyll to Haemoglobin', and 'Participatory Urban Metabolism'. The slides featured microscopic imagery, closeup photographs and art-historical references to enliven ecological principles: interexistent biological relations were rendered in image and text into graspable, socio-anatomical conceptions inspired from the methodologies of Goethean phenomenology (Holdrege, 2010).

> You show the plant seed next to the human embryo. That way I can very easily connect myself with nature. People usually think we are human and different from plants but when you look close and put them side by side, you can see the linkages. It is very inspiring for us to think like that [Felix, exit interview].

> I do like the whole concept. It's very eye-opening. In a different way, a fresh perspective, to rebuild a relationship between the plants and us and our 'waste' and also doing a logbook. Scientists, are very raw and rudimentary in this. Here I could see the design, very detailed and well thought out to make it work. Everything in this set-up seems to connect. Your body, your life, your heart, even your sleep… It is in your house, in your washrooms and in your bedroom [Oscar, exit interview].

In this architecture of nurture, the centrality of the correlation between regeneration and degeneration took hold on a profoundly personal level. Two collaborators indicated how the hands-on, biophysical dimension of cultivating plants from bodily residues of one's kidneys and lungs[26] has apparently contributed to unprecedented dimensions of interexistent contact.

> I learnt about the respiration of plant roots [laughing] that we can use our mouth to blow the oxygen into the plant. It is truly a direct, biological contact [Helga, exit interview].

> I got into a direct exchange with the plants and I think this idea is very interesting [Eliza, exit interview].

Compared to other kinds of collaboration, acute collaboration is an all-hands-on-deck approach to crisis where people assume responsibility for taking coordinated action. As rightfully pointed out above, facilitators had inadequate scientific competence to comprehensively run this sanitation-to-horticulture experiment. Being aware of their

[26] The exhaled air from the human respiratory system contains about 16% of oxygen and only 4% of carbon dioxide (Johnson, 2016), making it chemically suitable for aeration of plant roots.

limitations made the facilitators regularly reach out to knowledgeable members in the group. It required to shift from a mentality of separation to acute, intra-expert collaboration.

> One thing I appreciated, you [the facilitator] often told me before the workshop that you may need my help, for example with troubleshooting, or sauerkraut making, or something… so I could mentally prepare for that [Cella, exit interview].

During exit interviews a some collaborators realised how the punishing hortitechnical limitations were the result of a lack of upfront collaboration. It signals a mental shift from reactionary co-learning (as unfolding events demand) toward investing with foresight (before the situation is created). Oscar in his feedback asserted how he would invite his former students all over again into the study, granted, he could assist beforehand to improve the biopedagogic logistics.

> If I understood more in advance, I would have tried to help you [the facilitator] before the project. Not only with help but with assistance and consult on scientific procedures. To make them more viable one should know and simplify all the procedures within the project. Because people are too busy and can't spend a lot of time to get things done [Oscar, exit interview].

Before the study had officially ended, many collaborators similar to Oscar were eager to contribute their insights for improving the next stage of this homemaking adventure.

5.3.3 · Experimental learning?

The acutely collaborative 'urine recoding' study has attracted a group of people who proved to be tolerant of ambiguity. The more uncertain the study turned out to be, the more likely the participants were to collaborate and to trust others as well as themselves. A horticulturally less seasoned collaborator reported how the continued suffering of plants confronted him with unresolved emotions from past experiences. Another, horticulturally more accomplished, realised in astonishment how the futile yet intense process of trial and error has effectively increased her fondness for nurturing plants. Possibly the interest of a diverse group has confirmed the social relevance of plant nurture and emboldened the self-esteem of the veteran gardener.

> My motivation for planting has improved. Yes, despite all the shortcomings of this project. I felt the concerning part is the urine solution and I believe it can be improved so that the plants can grow stronger [Helga, exit interview].

The study simply asked collaborators to self-observe and record their eating and lifestyle choices. Any other action was left up to them. A younger collaborator introduced yoghurt into his diet and reported higher acidity (sourness) in his urine's test results. Others also considered intervening in their food intake.

> In our group we discussed to change what we eat, so we wanted to have a different result for each day [Nancy, exit interview].

Many collaborators indicated they did not prepare the majority of their meals by themselves due to workplace conditions, family setting, reliance on domestic workers, or social occasions making them dine out. However, striving for more agroecological integrity – decontaminating human 'waste' for environmental stewardship – has implications beyond food intake. The discussions about widespread toxins in bodycare products with their accumulative burden[27] ending up in the human organism (Liboiron & Dillon, 2013) has prompted Mike to start a follow-up experimentation.

> The project had me made my own deodourant which is an interesting challenge. Yeah, sometimes it works, sometimes it doesn't [Mike, exit interview].

Apart from extending agroecological skilling, collaborators connected with practitioners they otherwise would not meet. This can be relevant for individuals who are already reorienting their lifestyle choices toward interexistent flourishing.

> The project gave me a lot more starting points than before I started. Like for example this fermentation thing with practitioners like Wilma and Cella. I am also interested to take a look at Felix' farm if it is possible [Vincent, exit interview].

For some collaborators, this study may well be the only occasion of active urine reuse in their entire lifetime since as urban dwellers they can be constantly connected to a sanitation system. Withholding urine from the grid of conventional 'waste treatment' is in itself worth contemplating.

> No, the project was not a waste because I wanted to join and stayed motivated in this experience. It very well can influence my future life. Because I am engaged in this hydroponic [planting] already. So using the urine is a good choice, a good attempt [Khai, exit interview].

[27] Anthropologist and discard researcher Max Liboiron (2013) coined the concept of "body burden" to describe the steadily accruing pollution with industrial chemicals, microplastics or radiation in the human organism over a course of a lifetime: https://discardstudies.com/2013/09/16/body-burdens-biomonitoring-and-biocitizenship/

For Eliza, who hustled her way out of the technical restrictions and succeeded in nurturing Navy Beans (Haricots) out of her urine, the study's organisational standard may be fruitful for her own research initiative.

> I just want to say thank you because it was a great opportunity for me to join this project. And it was very well prepared. After the first workshop I thought to myself, this is like a model: Next time when I approach a new project, I hope to match this kind of level. It was great [Eliza, exit interview].

The study became an expression of being civically active as depicted in photograph (figure 49) or differing from societal norms. In this sentiment the exit interviews were often both project evaluation and preamble for personal conduct or future scenario for life-affirming cohabitation.

(figure 49) **Civically active: show-and-tell at the 'artisan instalment'**

Participant were asked to bring their plants back to the workshop for inspection and support.

Why would people bother with a technically failed project? The answer comes from how success is defined. Some collaborators were willing to let go of instrumental demands and see the study for what it was: a collaborative exploration for opening discussions on the kind of modes of living we want, as individuals and as entangled members in worldmaking ecologies.

> I certainly would participate again in the project because it will influence our future world. In Hong Kong, all life processes are really detached from nature. This research trial, this attempt, can encourage us to know more about green living in the future. Like others, I am not really successful [growing plants] this time. But I keep in my mindset how to embed green ideas into my busy life. The mindset is very important, not the

> technique, not the knowledge. It is about a greener life that you can practice by yourself, not just buying something 'green' like organic food from the New Territories instead actually using your small window as gardening space [Khai, exit interview].

Khai points to the dilemma of people with the desire to live healthier, more wholesome lives, who find their choices restraint in the reality of conforming to the seemingly inescapable given socio-economic order.

> People in Hong Kong are so busy, they don't have really time to grow. But some of them may have motivation and they don't want to be tied down anymore by their busy schedule. Some of them may like to change their lives. It depends on their motivation. But you may use an easy-to-use approach or method for them. Here I think window gardens can be quite important [Khai, exit interview].

The study was a trial for how reaffirming the individual's personal commitment in homemaking tasks can build expertise for reducing the overreliance on external forces and regimes that apparently make peoples' schedules so incredibly busy. This study was a minute attempt to provoke flourishing in more transpersonal modes of satisfying individual needs in less needy ways (Escobar, 2018:166). When people try to ferment their own fertiliser and grow their own food, they potentially need to purchase less, it may lead them to work less and free up time for what really matters most to self, others, and the planet: deep relationships.

Contrary to modernist conveniences that seek the carefree liberation from the burden of everyday tasks – based on reducing attention, capability and personal time – alternative modes of thinking and doing things entail much more personal obligation and deliberate processes of collaboration. Improving the utility and efficiency of this study would necessitate exactly that.

> We cannot continue to deal with our own waste in the way that we have been doing. We may technically not have been very successful. But it is worthwhile to promote critical thinking and discussion by having a group of people trying this out. I think this is the purpose of social experiments since people never contemplate this when they pee [Felix, exit interview].

From the point of view of many collaborators who could not appreciate the full value in social experimentation, the study did simply not deliver its horticultural promise and is judged accordingly.

> If the project would be already at a successful stage, I would easily share with others. But we are still in an exploratory stage so it is hard to tell others about it [Helga, exit interview].

Despite the lack of tangible – edible! – outcomes, and in the absence of public dissemination, what could possibly be the legacy of a technically failed study? When results are defined as hard, productivist outcomes, then the question of institutional accountability is ever more looming.

> And how are you [the facilitators] going to present these results to the sponsors? [Oscar, exit interview].

Social experiments and expanded, collaborative practices can be challenged to disseminate their intangible and internalised processes to society or academic community. The next chapter will be an attempt to better account for the affective dynamics in individuals and group in the face of collaborative challenges. The study made people come out of comfort zones, accept small changes in daily routines, tolerate probiotic accidents, keep positive attitudes when plants perished and converse with strangers. The study was capable of expanding human abilities through engaging with failure and frailty.

5.3.4 · Agential vulnerability

The study's title was 'ANTHRO', as in *humanly caused,* and 'PONIX', as in *toil* and *overcoming obstacles.* Obstacles can be a blessing in disguise (Trinetti, 2014) since substantial accomplishments normally are not attained in absence of obstacles and hard work. They are attained because of them. In overcoming rather than avoiding distress lies also joy, belonging and sensemaking (Brown, 2015). Engaging with these existential resources both in person and group – agential vulnerability – is the beginning of accessing human development.

> Thank you for making this happen and your passion for connecting people, urine and bacteria. I think it is a daring project in Hong Kong and I am glad it happened. I think in general it was a good beginning. And all beginnings are hard [Cella, exit interview].

Going through challenges can help people to learn more about their personal priorities. While vulnerability has a place for inner growth, the idea of failing as window of opportunity for daring changes in society could appear unrealistic in a world obsessed with control.

> Well, there is a lack of willingness to try things. I keep trying but it is just that scaling it and getting other people involved is a profound problem [Mike, exit interview].

The unprecedented obstacles during the study prompted collaborators with a choice. They could roll up their sleeves and do something about it. Or, they could resign and watch what their peers may come up with.

> So, I thought, well, if there is gonna be some extra research that's gonna lead us into something that's gonna be more successful route, I rather take that route [Bjorn, exit interview].

Most faced up to the challenges and had the resolve to improve an unsatisfactory situation. The hyperactive lactic acid bacteria added to the urine made tubes go bust on *day one*, was something that actually grow on collaborators.

> In fact I was a little bumped out in the second week when the lactobacilli culture was not as strong [laughing]. I was like, why would you change this? Why not keeping it as a constant agitation? And there is a part in me thinking, I wish it would be as strong as the first one: we just tape it down, it is no big deal [Vincent, exit interview].

The acute collaborations in the struggle helped sharpen the focus on what was important. Collaborators stayed with the experimentation, because they wanted to do something decidedly purposeful for and with their reality—including homes, bacteria, and plants. With this ambitious yet collaborative quest, the obstacles that emerged appeared relatively small in the bigger picture, therefore becoming more manageable.

Ordinarily, metabolic circulations take place and we have no active perception in a mentality of unknowing and separation. Reusing urine made collaborators suddenly susceptible to pharmaceutical residues, environmental toxins and non-degradable microplastics (Tyree & Morrison, 2017). Collaborators' ability to control the biochemical integrity of food intake, drugs and bodycare products is very limited. Pharmaceuticals can linger in human organisms for weeks (Mullen et al., 2014) and antibiotics can sabotage the fermentation process for more than a month (Sollazzo et al, 2014).

At the last moment of the exit interview, Ron (22) confessed how he had inadvertently ingested flu medicine during the collection period and would have found himself trapped in a potentially eternal feedback effect of pharmaceuticals—if he were to eat his urine-bred beans.

> I want to ask you [the facilitator] something. In week two of pee collection I took some flu pills because I caught a cold. I wanted to get well quickly, so I choose the western pills instead of Chinese medicine. Therefore my pee may be not very good for the plants which grow out of it. If I eat them it means that I keep ingesting the medicine again, and again. I maybe get addicted to the pill (laughing)? [Ron, exit interview].

The laughter originated from instructive insight. Once such breaches are exposed they can direct how to prevent harm and what to do next: minimise toxins, share unassuming doubts early, and live with the consequences. The awareness and integration of breaches can also be seen as mental preparation for the inevitable in living life (Trinetti, 2014). The acute collaboration with living matter – by propagating, inoculating, fermenting, seeding, aerating – was first-hand engagement with processes of renewal, growth, life and decay. When closely witnessing the serial perishing of plants so dramatically, collaborators were reminded of their own mortality.

> I mean it is better to acknowledging that you are dealing with this life-death cycle rather than avoiding it, right? I think that it is very nice that the workshops and project kind of triggered that. And at the same time that sense of wonder of what's happening in and around us [Vincent, exit interview].

This regulating awareness of mortality was brought up in the discussions with Vincent who had afterthoughts on the ethics involved regarding species-appropriate horticulture that this study prompted.

> We're basically tricking this life form, giving it what it needs and then telling it to grow. It is like satisfying its biological needs and then tricking it to fruition. This is quite weird for me. These thoughts kept lurking throughout all along and I am very glad the project triggered them. I don't feel good continuing to grow them. It's like growing Frankenstein in tubes or something [Vincent, exit interview].

The circulation of nutrients between collaborators and their plants triggered conversations on what dignified expressions of agroecologies or humane horticulture could mean. At the same time, when collaborators perceived how their attention to diet and bodycare had a direct impact on their self-fertilised plants, it brought up shared perspectives of flourishing.

> If we are aware that this type of diet or that kind of behaviour will harm our surroundings, then if possible, we need to abstain from doing so. Actually, we should

> not have the concept of harming others. Harming others is a strange behaviour [Eliza, exit interview].

> We are now at a time where we can have perfectly good soil if we want to pursue that. And it would be the most natural way to do it. Instead, we are destroying the earth and putting in resources for going to Mars and exploring forms of life and survival there [Vincent, exit interview].

Paradoxically while much effort goes into building interplanetary colonisation, renewing soil ecologies and water-based plant cultivation on "Spacehip Earth" (Buckminster Fuller, 2008) is still poorly understood as the studys hortitechnical failure has clearly demonstrated.

> I still don't know how to do it, closing my loop! I need to try it, I think I need to try on my own and see how it goes. Go back and start the fermentation part [Mike, exit interview].

This hortophilic ménagerie tried to build abilities – that reached across people, bacterial and plants – and explored arenas of social value creation which brought impetus to coping together, in turn making possible collaboration and experimental learning. Coming to grips with obstacles, this study turned out to be (against better intentions) about learning how people can generate agency in joint situations of uncertainty and failures.

5.4 · Explorative collaborativeness

As the ethnographic accounts indicated, collaborators evidently have, by and large, enjoyed the journey, from exploding urine, sacrificial plant nurture, to completing a shared experimentation. The study has supported learning and experimentation processes in a positive atmosphere, conducive to working and persevering together. The quality of collaboration was manifested in two aspects. First, the effects of collaboration were diverse yet significant as regard to personal commitment in the face of adversity when collaborators were able to establish co-agency. Second, collaboration fused visions, ideas and activities into tangible, everyday practices aimed at functional cohabitation. Such shared and methodical processes of attempting, envisioning and activating toward the achievement of synergies as indicated by educational researcher Aini-Kristiina Jäppinen (2012) as *collaborativeness*.

Collaborativeness is a framework to enhance learning effectiveness through the mutual and emerging integration of diverse forms of knowledge, skills and abilities of all actors involved in educational efforts (Pedder & MacBeath, 2008). Collaborativeness is not exclusive to institutional learning since it is grounded in distributing educational leadership inside and outside of learning situations. The collaborativeness concept necessitates communal working modes with co-agency which makes for more self-motivated, "responsively leaderful" (Graen, 2007) collaboration. Such learning environments are at the same time fluid, changeable and complex (Fenwick, 2012).

Collaborativeness specifies the systematic measures of direct involvement around common values, interests and aims for accomplishing something larger than the collaborators can achieve by themselves (Thoonen, Sleegers, Oort, & Peetsma, 2012). Thus, collaborativeness stems from deliberate and joint efforts *over time*. The essence in collaborativeness is "synergy creation" (Bandura, 1997) where joint understanding and ingenuity is involved to make the whole greater than the sum of its parts.

Paramount in collaborativeness is how each member as part of a shared effort is steering the pedagogic actions in mutually agreed modes and agreed directions. The collaborators in the study were participatory co-leaders in exercising their activities, values and practices. While these target-oriented, collaborative activities converged in the shared, durational effort, Cella indicates how each collaborator had the freedom to make independent pedagogic decisions:

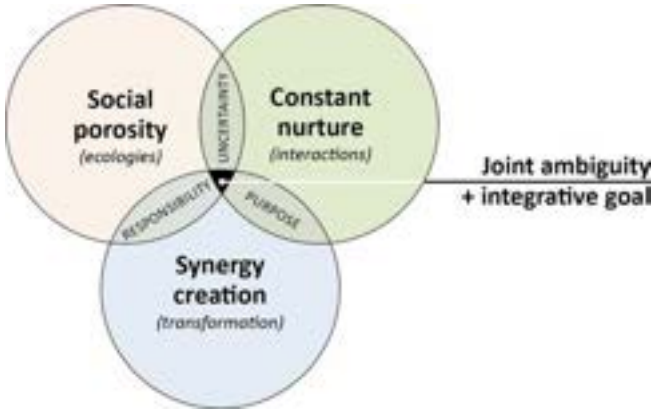
> It felt a bit like a student union to me. Ahm, yeah, because we were all adults and we could all make our own choices, and if somebody doesn't like it, he or she can do it differently [Cella, exit interview].

Collaborativeness typically is a process where "educational actors intentionally, synergetically, and systematically share a common mission" (Jäppinen et al., 2016). In the real world, articulations of collaborativeness can be diverse and complex. For addressing this complexity, there exists an evaluatory model named TenKeys® in education research that characterise the ideal state of collaborativeness which in real life is never completely realised (ibid). Against this ideal characterisation, the actual state of collaborativeness can be revealed in a schooling situation. Since the concept of *explorative collaborativeness* has

emerged *post factum,* – i.e., after completion of this study and in the course of its analysis – the study's ethnographical account cannot be examined through the TenKeys® model. Instead, the findings in this study are organised by the core research lenses (ability model): perspectives, interactions, and interventions that were introduced in chapter one (1.3.2).

In analytical extension, these lenses and the dynamic relations between them was then correlated with the attributes of the collaborativeness which are: communication, expertise, polyphony, responsiveness, commitment, arbitration, self-reflection, and confidence-based decision process (ibid). The semantic data interpretation of participants' ethnographic account deriving from these ten attributes indicates that the main factors for the collaborators' perseverance in adversity was a *dynamic relationship between joint ambiguity and integrative goal* as shown in the following Venn diagram (figure 50). This dynamic relationship had three practical dimensions, that were essential for *explorative collaborativeness* to take hold and making this study 'failure-friendly': *social porosity* in terms of mentality, *agential tasks* in regard to direct involvement, and *manifested validation* as for transformational potential.

(figure 50) **Explorative collaborativeness: Factors in failure-friendly, communal experimentation**



According to participants' accounts their perseverance in overcoming obstacles stemmed from a jointly encountered unresolved situation in combination with an overarching cause that made it worth to stick with it.

5.4.1 · Joint ambiguity and integrative goal

The dynamic relation of joint ambiguity and integrative goal – as seamless momentum – allowed collaborators to flourish for 42 days in the face of adversity. The trustworthiness in the experience of shared uncertainty could give way to productive exploration because it was carried by an energising, overarching mission integrating all involved including their actions. This kind of 'learnfully' adapting amidst uncertainty was firmly established in the study, as one collaborator remarked:

> You [the facilitator] are not establishing how it is supposed to work. You want people to try different things and then share what has worked best [Cella, exit interview].

Each collaborator (and their cohabitants at home) were doing and contributing something essential. 'People trying different things' means that a large pool of talent arrived at workshops and contributed to the study. For the learnful adaptation to take root it had to occur also daily as embodied activities, thereby endorsing collaborative learning across all life domains:

> Everything in this set-up seems to connect. Your body, your life, your heart, even your sleep… It is in your house, in your washrooms and in your bedroom [Oscar, exit interview].

The joint ambiguity: With uncontrollable dietary variables, untested planting contraptions, unreliable biopedagogic devices and language barriers, ambiguity loomed large in this study. Ultimately, overcoming obstacles required collaborators to let go of routine participation and acquire deeper, more dynamic modes of thinking and acting.

> It was an experiment after all, and things do happen we cannot expect [Khai, exit interview].

Building trust amidst this uncertainty was essential. In studying prosocial behaviour, Vives and FeldmanHall (2018) argue, how situations of incomplete knowledge warrant intensification of social exchanges and devoted collaboration. In situations where collectively the encountered ambiguous is perceived as nobody's direct fault, the possibilities of knowing more are emphasised over the contingency of costly risks.

> Actually, the group helps people to continue, because you know that what is failing, is not just your own problem [Clemens, exit interview].

The challenges encountered in this study have galvanised people, rather than divided them. All conversations in workshops, messaging group and interviews with facilitators focused on the system's shortcomings, improvements and learning. Nobody pondered on the causes, cover-ups or the personalities involved.

When ambiguity arrived, it was self-evident how they were unintended. This allowed collaborators to trust the integrity of the facilitators. In this conditional social cohesion, emotional tension and creative opening existed simultaneously, presenting incomplete situations that required resolution.

> Actually, it really is in the group where this works. It is a sense of some kind of common experience of overcoming common trouble. That's just nice [Vincent, exit interview].

Ambiguity in itself is hard to endure. Joint ambiguity in contrast is complemented with a sense of shared responsibility and direct involvement. This was helped by the fact that facilitators were simultaneously undergoing the same activities and troubles like everybody else. Facilitators also owned up to their miscalculations and shortcomings, that had caused the precarious situation in the first place. This helped to reduce hierarchies and open the floor for addressing the relevant concerns on hand.

The integrative goal: The attempt to close the nutrients cycle has consolidated traditionally separate disciplines and diverse modes of thinking-in-doing. The collaborators needed to acquire and reassemble the languages, concepts and methods from established fields of expertise in order to resolve an issue, describe a phenomenon, strive for material outcomes, or articulate questions in the workshop. For persevering in adversity together the integrating and overarching goal was imperative. Through the integrative goal of growing plants out of urine, collaborators had to grasp an authentic understanding of the knowledge and skills involved (Huber & Hutchings, 2004).

The integrative goal was also aimed at restructuring the given situation and introducing small changes in personal life conduct. This integrative approach to learning, ultimately has prepared people to expand pre-exiting conceptions and bring into reality what initially was just a vague intuition or deemed impossible.

> Yeah, when you told me about this project, it was already something I was thinking about it. The missing part of the loop, really, with hydroponics. If you can solve that without having to keep fish alive, then great [Mike, exit interview].

The integrative goal pursuit also triggered a cascade of subsequent, smaller and larger goals. The aspiration of nourishing plants with body-derived fertiliser motivated the coordination of eating behaviours, while the nurture of plants often necessitated reorganisation of space on the window sill. The continued struggle associated with goal pursuit in some cases required mutual support, thereby fostering connections with others. Participating in the study could also serve the more strategic purposes geared toward developing personal career, stature or trait.

> When I knew about your project, I was sure that the result is not good: so I joined! [laughing hard] I knew that this resource, maybe the proportion is very limited. I simply was interested in what would happen. Sorry, I still joined in... [Wilma, exit interview].

Integrative goal pursuit is dynamic and stipulate dynamic reasoning. Wilma points to the captivating quality in the constructed betweenness of people who are gathered around pursuits, prototypes and pressures in a defined context. In this sense, integrative goal in joint creative processes has also been referred to as “collage-making” (Huybrechts et al., 2014:170). Collage-making in collaborative situations means the ‘bonding element’ which can hold together a myriad of components from various contexts that are fused into one thing.

People, health concerns, family life, eating patterns, sanitation, microbiology, weather conditions, and hortophilia were mixed into one study. All involved thereby are brought deliberately into uncertain positions that can unbound status, expectation and learning that obviously was a captivating proposition.

> I really love plants and really wanted to know whether this type of growing can be applied in Hong Kong [Helga, exit interview].

The dynamics: The basic human desire for completing the incomplete (meaning consolidation) can be a generative driver in the creative tension of joint ambiguity and integrative goal. Collaborative learning in this dynamic relation – trusted uncertainty and deepening goal pursuit – during the study was realised differently, depending on collaborators and context. Explicit ways of collaborative learning happened at the

workshops. Planned and spontaneous encouragements for collaborativeness in precarity during workshops included avoiding hierarchies and actively stimulating contact among all involved.

> Without any reason, I would not really go out and talk to anyone. But [during peer exchanges] I really was listening to what they were saying. I know, I am a very good eavesdropper [Vincent, exit interview].

More implicit modes of collaborative learning emerged at home where collaborators were their own masters in their experimentations. By implementing the procedures in the context of everyday routines, collaborators needed to account for diverse opinions and potential disagreements with close others as indicated in this urine explosion anecdote.

> It wasn't overly smelly but a little bit and I got a few comments from my wife and it was alright. I mean we got used to it [Mike, exit interview].

Being their own masters, they had to respond to the situation, make decisions, and reorganise on the spot to make the experimentations work for them. In the dynamic wayfinding process of integrating study tasks with family life and everyday functioning collaborators had to become experts in their in-situ homemaking intervention.

> Getting up in the morning and remembering to pee in the cup was a bit difficult. Also, if you get up in the middle of the night, do you go then or… what do you do? [Mike, exit interview].

Interventions in homemaking are hard work, demand compromises and require expertise, time and emotional investment. Reorganising homemaking practices does not get established overnight, it grows slowly. It needs time, patience and dedication to endure incompleteness.

> This is not yet complete and I need to complete the project. I need to look at the plants, grow them up and eat them! [Titus, exit interview].

This touches on the limitations of explorative collaborativeness in this study. In daily life, collaborative learning and sensemaking are the result of extended processes of incremental advancements. Due to the study's brevity, the explorative collaborativeness needs to be viewed as precursor of long-standing processes in communities and institutions toward mutual and deep learning (Jäppinen et al, 2016).

In the following section the three relevant factors in explorative collaborativeness – social porosity, constant nurture, and synergy creation – will be further explored.

5.4.2 · Social porosity

The first collaborativeness factor can be described as social porosity. The study was found to promote agential features during the experimental process that interlinked collaborative relations from the home to the workshops and into the interactions that ensued. Social porosity was present through implementing facilitation, rules, and guidance in ways that fostered self-directed and emergent learning amidst adversity and across separate life domains.

> It is certainly good to bring in different people. Some have a hydroponic background and provide welcome suggestions. At the same time everyone is doing the same task and then people who don't stick to the rules actually seem to get the better results [Clemens, exit interview].

The study stipulated trial and error to foster self-reflection and solution-finding in collaborators. This encouraged advancing in ongoing involvement and accessing the learning that emerged in the group. In this coordinated setting, it is expertise instead of power that is directing productive collaboration (Leithwood et al, 2008) through collaborators who possess or can acquire the necessary knowledge or skill.

> It is a quite fast learning experience because I could access various expertise and experiences. I am getting insights from others about the intricacies of the process, since initially, I have no idea how to use the urine for planting. The most important is the direct interaction [Khai, exit interview].

Seeking solutions in oneself or in others that is emancipated from top-down initiatives, means that collaborators were in charge to decide what was to be discussed. To some degree, this common understanding shifted the responsibility and authority in the study from the facilitators back to the collaborators. The distribution of control was not only a matter of formal organisation and social fluidity. The implementation of tasks happened mainly in the familiarity of the home, thereby exercised according to the collaborators' interest and level of expertise.

> In every workshop I learnt a little bit more, then observe and trying to do something at home, then come back and interact with others about it [Jyll, exit interview].

> Every time there is some kind of presentation, some type of knowledge or skills, and something that we can take back home, like the equipment and things. I think it's interesting [Igor, exit interview].

Both at home and during workshops, the diverse needs of collaborators were recognised, which in turn got them on board and stimulated extra effort. When the situation required, there was more willingness to keep up the hard work—more so than if someone instructed them what to do.

> Eventually a peer recommended to simply shake it, release the bubbles from the tubes (bzzz-bzzz-bzzz) and then put them aside. I tried that and then it was okay [Khai, exit interview].

Social porosity, also implies the availability of secure zones for relevant issues to play out on the sidelines. There was ample room for spontaneous exchanges in the familiarity of the home or the privacy of the messaging group. Such interactions are meaningful when the individual progress of people finds consideration in a way that is focused on the topic and the methods in question. At the workshops making room for collaborators' interventions meant for example, that facilitators requested translation help among peers when the interpretation was incorrect, or invited collaborators with more expertise to take charge in conveying specific topical concepts.

Social porosity also derived from the relational cohesion attached to the physicality of the study's purpose, including the material props and bodily. The social relations emerging from the material engagement of stationing contraptions, improvising with bathroom routines, discerning biopedagogics, and improving the faulty system, inevitable did engage (directly or not) close others in the house. The socio-material dimension could be divisive or cohesive, depending on context which in any case was socially mobilising.

5.4.3 · Constant nurture

The second collaborativeness factor was found to be constant nurture. Activities that foster holistic personal growth, nourish or endorse, educate or cultivate are considered nurture. Constant nurture is a vital concept since purposeful collaboration in the face of ambiguity requires persistent nourishing. In this study, the facilitation of constant nurture, began by inviting diversity into preparation, participation, and evaluation.

> It is totally great for me to be in such an eclectic group because otherwise I never had such people around me. This occasion brings them closer to me [Vincent, exit interview].

Mobilisation of nurturing entailed pedagogical measures like *practising*, *surprising*, or *inspiring*. Practising meant, for example, in the first workshop to make sauerkraut together in the group, as means to share a productive and gratifying experience. Practising can also entail the response to specific needs, brought up in unexpected situations. Unfamiliar smells, for example, can call for immediate clarification.

> You [the facilitator] replied and said that the solution has an 'earthy' smell, and after that I believe you. It changed my perception. Actually, I didn't mind the smell, it didn't really disturb me. I was just concerned and not sure what the smell was about. So when you told me, this is a normal situation, then I can accept that [Eliza, exit interview].

Surprising here is about spreading astonishment and infusing the process with excitement and enthusiasm. Such affective dimensions sent important signals to collaborators about the mutually held relationship of the group.

> Actually, what I liked the most, was to witness how the other people were excited. And to see that there are actually people in Hong Kong who are interested in fermenting their urine. That kind of blew my mind, because I thought that is impossible [Cella, exit interview].

This shared excitement could outlast the six-week study, because it remained surprising. The lectures were interspersed with hands-on demos of urine and planting procedures, which allowed for amusement and humour to emerge. Room for spontaneity was each workshop opening with the peer-to-peer questionnaires that provoked direct responses to urgent issues. Inspiration also ensued from the display of acknowledgement of accomplishments, small or big, contributing to the joy of working together.

> At the last workshop, I suddenly discovered the interesting bits about the project. Ever since I wanted to know how the roots, how the plants can be helped to grow. Because some peers actually managed to grow real plants [Becky, exit interview].

Some peers were excited to show off the quality of their work while others became (re)energised. Constant nurture therefore is a vital contributor in the transpersonal, regenerative dynamic known as synergy creation.

5.4.4 · Synergy creation and generativity

The third collaborativeness factor was synergy creation. Collaborating in a solution-finding process for improving technical shortcomings required synchronisation of expertise, ideas and action all at once. Synergy creation depends on the accomplishment of tasks through multilevel social engagements. A central aspect in synergy creation is collective intelligence, the idea that collaborative groups are more inventive and agile than a person working in solitude (Graham & Ferriter, 2009:185). Collective intelligence proved to be especially relevant in the ambiguous situation where fluid exchange of ideas and knowhow was vital for advancement.

> Well, it is interesting: if you bring in a lot of people, then you are also learning really fast, right? [Cella, transcript workshop five].

Since the generation of expertise came from within the group, it had to be adequately supported by the facilitators: they needed to develop their competence for responding to the changing needs of collaborators, so that they could confidently pursue their individual learning paths. It entailed attentive listening to anticipate unarticulated concerns, or releasing additional instructions when procedures needed clarification. Synergy creation could also arrive from simply stepping back and making room for insights to emerge.

> Many people were very new to it the subject matter. It is interesting to see how they have interesting discoveries. So I try not to make any judgement or give them any comments because it is more gratifying for them to experience by themselves [Felix, exit interview].

> The project gave me a lot more starting points than before I started. Like for example this fermentation thing with practitioners like Wilma and Cella. I am also interested to take a look at Felix' farm if it is possible [Vincent, exit interview].

Both Felix and Vincent mention the possible beginnings of new learning journeys. Synergy creation here implied the opening of perspectives that extended the use-time of the study. After the study had ended, Cella advanced the urine fermentation growing concept into algae reactors for purifying air. Titus utilized his sauerkraut juice for follow-up experiments with upcycling soybean residue. And Wilma visited Felix' research farm for potentially extending her farming intelligence.

Such collaboration that extend self-directed options as exploration unfolds is considered 'generativity' (Avital & Te'Eni, 2009). Synergies in this generativity was created on one side

through the converging experiences of facilitators and participants (hybridity), and through the incompleteness and imperfectness such joint processes presented (Huybrechts et al., 2014).

5.4.5 · Figure/grounding of existential needs

This chapter tried to understand what made people stay engaged in a failure-prone, social experimentation. Through interpreting participants' accounts it was found that the study engendered *explorative collaborativeness*. It describes a shared, methodical coordination of ideas, efforts and activities that generate synergies in communal experimentation. The study accelerated team learning within a captivating, overarching mission which engendered testing, validating, and improving that was mobilising participants via agential, daily tasks and multiform involvement. The dynamic *relationship between joint ambiguity and the integrative goal* provided the crucial impetus in *explorative collaborativeness*. Central to this dynamic is how the inadvertent ambiguity shared in the group with overarching motivation induced 'learnful', essentially enjoyable adaptation.

Guided, social buffering dynamics: Existing research demonstrates that trusting and cooperating under uncertainty is essential for personal and interpersonal advancement (Vives & FeldmanHall, 2018). Through shared coping in the study, adaptation had multimodal and socio-material implications. The jointly encountered ambiguity and the integrative goal created momentum for persevering and overcoming obstacles in more nimble ways. Explorative collaborativeness is conditioned by pedagogic factors as *social porosity*, *constant nurture*, and *synergy creation*. By considering joint ambiguity and integrative goal as a pivotal dynamic, the study brings together two research areas that are usually investigated separately: the shared sphere of joint coping (for transpersonal reasons) and the personal domain of self-support (for existential needs).

This suggests a shift in perspective, from a focus on states/attributes – like *participation* or *creativity* – toward the dynamics that failure-friendly, communal learning is relying on: social buffering and existential tipping points. It is relevant to deepen research on conditional factors that foster the dynamic relationship of joint ambiguity and integrative goal. It is crucial to investigate the potential transition points when this dynamism is fading or stalling.

Therefore there is a need to describe the criteria underpinning this dynamic continuum for improving interexistent, ability-expanding, participatory learning situations.

Developing interexistent self-coherence: In this eventful study the horizons of meanings among participants have gradually evolved. Initially, the raising of plants and closing the foodloop provided initial enticement. As the study unfolded, all involved were prompted on the day-to-day level and on their own terms to stick with the obstacles arising and make sense of the process. Since 21 other collaborators remained motivated to make sense of this struggle it created also a communal level of meaning—the constitution of a 'we' that nudged a working alliance into an expression of companionship or joint destiny.

Sociopsychological research confirms how the access to oscilating horizons of meaning is the requirement for the wellbeing in individuals and groups (Sonne and Tønnesvang, 2015:65). In the integrative expansion and contraction of sensemaking with their environment (figure/ground), persons are constantly realising an interexistent self-coherence that simultaneously asserts their autonomy, competences and relatedness. This is well documented in self-determination theory (Deci & Ryan, 2014) and to be explored and applied further in the next chapter.

People are meaning-desiring animals and the hortophillic ménagerie of this study was able to establish dynamic narrative dispositions, conducive to expand the spectrum of interexistent self-coherence in most participants from cultivating an enlivening reconciliation between internal and external, as well as familiar and unfamiliar ecologies of existential needs. These transpersonal dynamics warant more attention and graspable expressions of this analysis.

1

Adventure Renderings

This chapter analysis through visualisations the existential dynamics of study participants for better understanding the conditional factors in failure-friendly collaboration.

The previous chapter evaluated based on retrospective accounts the group pedagogic dimensions that assisted them in enduring an adverse situation. This chapter analysis seeks to trace the fluctuations of internal existential wellbeing in individuals based on their deliberate interactions, measurable effort, and observable demeanour throughout the six-week long study. It seeks to approach the dynamics of how collaborators realised their potential in the face of uncertainty.

The aim is to better understand the prosocial dynamics in collaborative processes by rendering them. *Rendering* here refers to the reflective practice of making marks in order to facilitate a conversation with oneself (and possibly others) as described aptly by Ranulph Glanville (2009). The main purpose is to find out how the *explorative collaborativeness* uncovered in the previous chapter has affected the flourishing of individuals and group involved. *Adventure* refers to the developmental potential vis-à-vis the challenges presented. In combination, *adventure renderings* are experiential markings that assist the reflection on transition points of mental adjustment dynamics and existential wellbeing.

Existential wellbeing: The previous chapter indicated how participants we able to mentally prosper amidst an uncontrollable situation. Failure let to flourishing rather than fiasco. The horto-ethnographic analysis pointed to the dynamic continuum of sensemaking in participants that correlated interior and exterior horizons of meaning thereby engendering various degrees of interexistent self-coherence. Research on mental wellbeing specifies that a fulfilling life pursuit originates from the psychodynamic of seeking enjoyment in the *present*, and finding meaning *over time* (Ryan et al, 2013). In this regard, the hortophillic ménagerie of the study has offered an integrative goal that provided durational purpose, the

call for duty[28] (eudaimonic pursuit) while the joint ambiguity offered the lure of the unknowing thus the pleasurable desire to find out (hedonic pursuit). The sweet spot in this flourishing dynamic is to facilitate this meaning coordination between duty and pleasure where neither factor is driving each other out (Ryff & Singer, 2008). To approach existential wellbeing holistically, the interrelations of individual, with group and situation are essential. This necessitates in this chapter to draw simultaneously on research from pedagogy, sociology and motivation research.

6.1 · Mental flourishing

Mental flourishing contributes to more adaptable, thriving populations when people can function well and personally grow (Roe, 2016; Morgan et al, 2013; Francis et al, 2012). Recently the World Health Organisation initiated a Mental Health Action Plan (WHO, 2013). since the mental flourishing of individuals is elemental in long-term advancement and future of societies.

> Mental health is a state of wellbeing in which every person can realise their full potential, can cope with normal stresses of life, can work productively and fruitfully, and is able to contribute to the community [WHO online, 2013].

As indicated earlier behaviourist dichotomies like health-disease or cause-effect are unhelpful (Huybrecht et al, 2014:134) because it obstructs the attention from the actual processual dynamics true wellbeing stems from. Therefore, humanist psychological traditions put emphasis on the contingent “unblocking process” (Perls et al, 1951) that the realisation of fuller mental potential is about—rather than identifying and correcting illnesses or behaviours (Kimball & Barcia, 1993:34).

[28] In a well-balanced life, both eudaimonic thriving (subjective prospering) and hedonic thriving are in close relation to each other (Chen et al, 2013). Eudaimonia is a perspective in moral philosophy where the flourishing of individuals and communities originates from the adequacy of actions inside the present world where duty and pleasure necessitate each other, becoming a dynamic continuum (Sonne & Tønnesvang, 2015:51).

6.1.1 · Flourishing as capacity building

Mental flourishing is about nurturing pedagogic, preventive and reintegrative work that assists individuals to prosper as person and become actively contributing parts of a societal whole (Sonne & Tønnesvang, 2015:167). Collaborative practice thus is interested in flourishing as outcome from capacity building (Perls et al., 1951:284) rather than correction, where individuals reach their fuller creative potential, engage in self-discovery, build self-coherence, and also thrive under difficulty. John Dewey (1997:79) articulated how overcoming challenges contributes to personal growth where past knowledge is reconfigured to the present so it enables flourishing in the future.

In this adaptive reconfiguration behaviours are then the result of social enactments of meaning where people interact with others and the world. Behavioural responses are not just about how a person acts and feels in relation to a situation. Rather than seeing behaviours as the outcome, they can be perceived as signifiers of persons' functioning in relation to social context and biographical disposition. Flourishing then is the adequate personal adjustment as the situation requires. Flourishing thus is about an awareness practice where the full meaning of past and future behaviour responses is mobilising (rather than predicative) for unleashing sensing, signifying and acting in the very present moment (Zinker, 1977).

6.1.2 · Analysing through rendering

Adventurous rendering is the attempt to reconcile insights emerging from the tension of confrontational situations on which creative openings, adequate behavioural adjustment, and long-term flourishing depend (Gilsdorf, 1998). If adventure is conducive to more integrative yet unbound forms of flourishing, then 'renderings' are about holding conversations together. In a practice that is neither about precise judgement, precision measurement nor control, analysis needs to be a cultivation of a coordinated unblocking process as well—rather than a preservation thereof. Renderings can help reflect on the flourishing dynamics of actions but not put a verdict them. Adventure renderings give the complexity of working with people a direction and discursive outlet, rather than a measure for health states and efficiency.

6.2 · Typology of autonomous flourishing

Recent sociopsychological research indicates how the relations that people form with others can help them overcome obstacles and by that open up new possibilities for more personal satisfaction in their course of action (Gore et al., 2018). This brings up two important aspects, namely, 'who' is affected by flourishing and 'what' is this flourishing about. The term *autonomy*, addresses these aspects. From Greek *autonomos* for *autos* 'self' and *nomos* 'law', means the specific subject ruling over its ability to flourish. The subject is the vulnerable self determining the existential qualities of living well.

Historically, the term autonomy in psychology has focused on the "Me", the individualising protagonist, and less on the "We", the integrative form of autonomy. Studies indicate that the consideration for others into one's behaviour response does not sacrifice one's personal autonomy. Behavioural responses that integrate autonomy needs and relatedness needs produce more flourishing than when there is a conflict between them (Luchies et al, 2011). While people chose and act in volitional or self-directed ways, they also strive to create relationships across life situations and experiences. It has been demonstrated how individuals who are forming and staying in quality relationships, enjoy longer, more fulfilled and healthful lives (Reis et al., 2000).

Much of psychological research on mental flourishing has emphasised the individuated form of autonomy and focused primarily on singular traits, resolve, persistence, and grit (Sheldon, 2014; Duckworth & Gross, 2014). The transpersonal aspects endorsing mutual attainment like attention, patience, or foresight inherent to social processes are considered secondary factors in mental flourishing (Gore, 2018).

6.2.1 · Beyond gratifications

As indicated earlier, a balanced life incorporates by its nature the flourishing of others. That raises the question how to account for mutual flourishing in this togetherness. The gratification of the individuals' needs has been commonly studied for finding out why people engage in social processes in the domains of citizen activation, media engagement and culture production. It considers how social agency in participation can influence or satisfy

certain concerns. The focus is often on positive outcomes like “feelings of ownership” (Bourriaud, 2002), “affective atmospheres” (Cloke & Conradson, 2018), or “cultural critique” (Huybrechts et al., 2014).

Research on citizen engagement tries to understand participatory behaviour in relation to how interests of participants are being attended and responded to (Verba et al, 1995). In this sociological view the ability to share influence and access resources is critical to joint participatory processes. The resources that people invest into participation – time, money, skills, hopes – are considered because they are easier to measure than the vast array of motivations. This research has established indicators for engagement that are categorised into selective *material benefits*, *social gratifications*, *civic gratifications* and *collective outcomes* (ibid:110-111). Here the assumption is that peoples’ foremost want to exercise their choice to decide, and acquiring capabilities.

Applying this sociological frame, the preliminary evaluation of the study screened and categorised the data for selective gratifications that participants have declared. The emerging concerns are summarised in the listing below (table 9) and detailed in the appendix. Due to the lack of productive (edible!) outcomes, the study obviously did not deliver much *material benefits*. Hence, participants deemed intangible benefits as important. As for *selective social gratifications*, participants expressed excitement to be part of an unusual experiment, to collaborate with likeminded people, or deepen relationships with influential others (friend, teacher, spouse). Some mentioned differing from social norms (based on anti-consumerist sentiment), or being recognised by others as reason of their contribution. In regard to *selective civic gratifications*, they articulated a sense of duty to help improve the procedures, contribute to legacy to this research, or endorse community and environment.

(table 9) **Emerging themes: What made persevering in project gratifying?**	
Intangible benefits	
Encounter the incomplete:	○ Speculate about enviro-toxins in urine ○ Curious about personal biomarking in urine ○ Regret undetermined outcome ○ Experience of being daring ○ Feel privilege in ability to fail
Environmental mastery:	○ Overcome family resistance ○ Pursue undercover mission ○ Remain loyal to subgroup
Confront existential tensions:	○ Anxiety from urine test ○ Saddening frailty of plants ○ Confess personal tensions due to plant suffering ○ Enter doubtful venture against better will (‘akrasia’) ○ Feeling unsettled by ‘tubed’ plants ○ Procrastinate for better solution to arrive
Selective social gratifications	
Differ from societal norms:	○ Want to pay for sensible use of human ‘waste’ ○ Want to regain self-determination over time ○ Want to live sensibly without a price tag ○ Want to practically rethinking our situation
Selective civic gratifications	
Obligated to greater good:	○ Hope to contribute to research legacy ○ Desire to return the favour in nutrients cycle ○ Set a sample for ‘right place’ of human ‘waste’
Imagining futures:	○ Contribute to technical improvement ○ Support mission of connecting people & ‘waste’ ○ Conceive byproduct reuse as creative industry ○ Bring more greenery into concrete jungle ○ Preserve local food culture
Findings from participants’ verbal statements without the integration of continuous behavioural observation and experiential typology.	

Gratifications are accounting for the participants’ individual needs at a given moment. With the assumption that participants function more or less insulary on their own terms. Yet, people do not act detached from others to gratify their needs (Chen et al, 2013). Gratifications are not sufficient sufficient to explain the complexity of forces that drive people to attain and perform certain goals. There are manyfold influences behind behaviour helping people to feel good about themselves, so mental flourishing is socially co-dependent.

6.2.2 · Framework of interexistent flourishing

The significance of relationships in human behaviour is well established in integrative traditions of psychology and motivation research (Deci & Ryan, 2014). *Integrative* refers to demeanour that is coherent with oneself in holistic relations with others. It creates an autonomy that is constituted through relatedness. In this view, behavioural responses fulfill *intrinsic* needs of the person that entail *autonomy*, *competence* and *relatedness* (ibid). Intrinsic needs describe the performance of person-directed, specific "activities for the sake of the inherent satisfaction that lies in the activity itself" (Sonne & Tønnesvang, 2015:61). Behavioural responses are an intrinsic pursuit, when the outcome is honed skills, personal accomplishment, individual development, enjoyment, or interpersonal intimacy (Deci, 1975).

Mental authority in intrinsic and extrinsic pursuits: Pursuits catering simultaneously to multiple intrinsic needs are conducive to mental flourishing, and tend to produce more durational outcomes (Kumashiro et al, 2008; Grouzet et al, 2005). In *extrinsic* pursuits, behavioural responses are driven by external motives. Here the intended outcome concerns tangible rewards, acclaim and recognition, or, the prevention of adverse consequences. Behaviour from extrinsic reasons, are performed to attain deferred, imaginary, or external satisfactions (Deci & Ryan, 1991:272). Extrinsic pursuits should not be seen in opposition to intrinsic drivers since they can be an integrated part in the individual's underlying *intrinsic* needs and are best understood by how satisfying immediate needs for relatedness, autonomy and competence are contributing to longer-term flourishing in self and others (Sonne & Tønnesvang, 2015). People may seek out externally driven rewards or agony for internally authorised, self-determined motivations (ibid:62).

Societal internalisation: This adaptively functioning from integrating short-term needs into longer-term pursuits is strengthening the internal authority of person in a process known as *societal internalisation*. It is the assimilation of attitudes, values and opinions of others into the formation of the evolving self which engenders personal identity and character. Accummulatively, this process leads to a mental autonomy with self-regulative demeanour, making humans the product of society (Ryan & Deci, 2000). Until recently, the quality of societal internalisation has been categorised depending on the degree the self-regulation process has been externalised or internalised. It refers to the sensed degree of innate control that govern the motivations and conduct of a person (Sheldon, 2004). In this view,

mental flourishing focuses on the presence of the individual in the spectrum between unconscious reactivity of the self (external authority) and conscious awareness of the self (internal authority). As seen above, optimal self-regulation (organismic integration) is not a closed, individualist mechanism, but a synthesis of values with existential competence that unfolds in a larger context (Perls, 1992).

Interexistential motivation: To better account for the interpersonal factors in this organismic integration, recent sociopsychological research gives insight for how relationships – rather than individuals – function as self-regulatory entities, whereby the relationships are superseding the ambitions of their individual members (Fitzsimons et al, 2015). Accounting for both the internally authorised as well as transpersonal facets in the self-regulation dynamics – mental authority and societal internalisation – current motivation research identifies three dimensions of behavioural self-regulation known as *personal autonomy, relational autonomy*, and, *controlled nonautonomy.*

Personal autonomy: In this authority-internalisation dynamic, the pursuit of goal stems from intrinsically self-determined, sovereign reasons. Personal autonomy endows the person with stronger, more enduring interest for pursuing action (Sheldon & Elliot, 1999). The rationale for behaviours derives from the person's own endorsement referred to as self-concordance, where reasons for behaviour are congruent with the trait and life narrative of the person (intrapersonal core). Hence, the individual works harder and longer to accomplish the mission set out (Koestner et al, 2008). This *personally-autonomous* expression of mental adjustment is conducive foremost to individual flourishing (Sheldon & House-Marko, 2001).

Relational autonomy: In contrast, this authority-internalisation dynamic emanates from the commitments and needs *within* dedicated relationships. Such relationships are defined by functioning and closeness, and not necessarily by affiliation (Gore & Cross, 2006). Akin to *personally-autonomous* adjustment*,* this type of goal pursuit is intrinsically driven yet under consideration of others. While personal autonomy is centred on the individual (acting for 'my interests'), the *relationally-autonomous* adjustment ensues from the relationship with another person—acting for 'our interests', or, acting for 'my interests and yours' (ibid). In relational autonomy*,* people pursue needs important to all members of the relationship.

Originating in relationality, there is a devotion to pursue goals which resonate with the interests of all involved.

Controlled nonautonomy: In the third authority-internalisation dimension the person may be controlled inwardly to evade feelings of shame, anxiety, guilt (introjections), or conversely, may be controlled outwardly by demands or expectations from another person or by the situation (coercions). In a misled fear of losing the connection with a relationship partner, *controlled* self-regulation may trigger a need to avert potentially negative ramifications, like their resentment or rejection (Sheldon & Elliot, 1998). This enactment of controlling motives is not conducive to personal thriving since extrinsically governed needs do not adequately represent the central believes and interests of the person's authentic self (Deci & Ryan, 2000b). Behaviour stemming from *controlled nonautonous* adaptation, tends to infringe in the long run on the deeper sense of self (Sheldon & Elliot, 1999). The person's mental autonomy is in peril.

Personal, relational and controlled autonomies: *Relational-autonomous* motives function differently from *personal-autonomous* motives. Since the interests of others and oneself are accounted for, *relationally-autonomous* pursuits tends to invigorate the individual in the pursuit of longer-term undertakings. While *personally-autonomous* motives are more likely to instil a sense of purpose and fulfillment in the person, *relationally-autonomous* motives are likely to boost the energy invested toward shared commitment (Gore et al., 2018). In *controlling nonautonomous* motives the purpose or commitment is significantly directed by external impositions or self-inflicted sanctioning, the person is much less likely to stay engaged, find satisfaction or enjoy the experience (Sheldon & Elliot, 1999).

6.2.3 · Analysing mental autonomies

The adventurous homemaking study has interfered with routines, impacted fellow home-inhabitants, thwarted expectations—simply presented challenges to participants. As indicated in Gestalt pedagogy, learning emerges precisely in these moments of uncertainty at the boundary between self and otherness, between known and unknown (Perls, 2005:109). Mental autonomy for the participants was about becoming aware of oneself in the exchange with this otherness.

The interest in this research are the adjustment dynamics occurring in this disequilibrium. For the mental autonomy shifts in boundary experiences can be opportunities of discovery and learning since the 'auto' (the vulnerable, porous subject) and the 'nomos' (the rules for flourishing) are being reconstituted in the dynamic of action or nonaction. Such ad hoc reconstitution of mental autonomies are the result from continued efforts over time (Zinker, 1977:36). Transpersonal factors – *relationally-autonomous* competences – are pivotal for perseverance and more durational commitment (Gore & Cross, 2006; Gore et al., 2018).

Motivation studies on perseverance are commonly based on surveys and self-chosen goal domains. The prosocial dynamics of a durational group effort integrating shared goals in the homemaking domain is less explored. In response, this analysis adopts analytical models from sociopsychological research and make them applicable for collaborative dynamics. In this grounded analysis, the measures and scales were applied retroactively to understand behavioural responses expressed in natural settings of daily life. Therefore rendered evaluation delivers indications rather than statistical validity. This an explorative analysis renders and typifies the dynamics of mental autonomy inside the complexity of collaboration with the following intentions:

- **Characterise observable** acts, recorded interactions, bodily presence and self-representation of collaborators via *existential components* analysis (introduced below) and puts them in relation to modes of mental autonomy;
- **Evaluate developments** in mental autonomy in regard to relational qualities manifested over the six-week period;
- **Correlate types** of mental autonomies with the efforts and mental flourishing of collaborators.

As manifested in the ethno-pedagogic evaluation in the previous chapter, only through purpose and group work was it possible to endure and find delight in a failing mission. So on the basic level, the mental autonomy in all study participants was relationally oriented toward the peer group. This relationally oriented autonomy emerges from the commitment that relationships can provide and can be both intrinsically *and* relationally motivated (Deci & Ryan, 1991).

Existential components in relational commitments: The existential aspects at play in relationally oriented mental authority can be differentiated (Gore & Cross, 2006). Motivation research is studying the existential components underlying *relational*, *personal* and *controlled* goal pursuit to better understand prosocial behavioural responses. Existential components are the acts, expressions and behaviours from observable forms of self-presence. Based on the societal internalisation of mental autonomy, this analysis discerns five *relationally-autonomous* existential components (transpersonal), and five personally-autonomous existential components (self-determined). These are relevant to what degree a person is integrating the concerns of others into her or his goal pursuit (Hester & Gore, 2015).

Within interexistential functioning, the research has identified *direct involvement*, *accountability*, and *shared values* as the primary three components in *relationally-autonomous* self-regulation that incorporates the interests of others. According to existing research, *mutual support* and *closeness to others* are assumed to be auxiliary components (ibid). The following specifications and statements of relationally-autonomous components are being applied in this study:

Direct involvement emerges when people conjoin and interact with others while pursuing activities with a shared purpose. When individuals have personal aspirations that they cannot fulfill on their own, they may link up with others who can be instrumental in attaining those objectives (Fitzsimons & Fishbach, 2010). Having partners who partake in a durational course of action can make people more relationally motivated. Studies show how for example physical exercising that implicates other persons promotes relational and health-conscious behaviour (Gore, 2014). For evaluating the direct involvement with other people, an interpretative statement was established and applied across data and observations to prioritise it:

> The level of direct involvement and interactions the participant has *manifested* toward peers, facilitators or others associated with the study.

Accountability is the feeling of obligation and responsibility toward others. It is especially relevant in situations of caring for another person. Caregiving may be directed through a sense of attachment. Care can also be provided by moral obligations to meet expectations of

the care recipient, or the avoidance of disapproval if caregiving is not provided (Kietzman, Benjamin, & Matthias, 2013). From their caregiving role, people may derive intrinsic value and self-worth. Thus, feeling liable and responsible for the needs of a closely related person or loved one can influence relational behaviour. For evaluating accountability, the Hester and Gore statement (2015) was adjusted to interpret the level to which the participant showed obligation to peers or facilitators in the course of the study. The following two statements for interpretative analysis were applied to data and observations to prioritise accountability in comparison to the other components:

> The level to which the participant perceives her/his success in this collaboration will affect peers' or facilitators' *opinion of participant*; and,
>
> The level to which the participant perceives her/his success in this collaboration will determine the *general welfare of others* [peers or facilitators] (Hester & Gore, 2015).

Shared values ensue when collaborative partners' have the same priorities in attitudes and beliefs regarding the mutually pursued intention. People involved with each other who share the similar attitudes or beliefs tend to be relationally inclined to work toward a common goal. Research indicates that they are also more likely to invest in objectives and quality of the relationship itself (Hui et al, 2014). For evaluating the degree of shared values, the Hester and Gore statement (2015) was adjusted to interpret the data and observations and compare the component in relation to the others:

> The level to which the participant had the same beliefs and outlook about the *importance* of this explorative collaboration [Hester and Gore, 2015].

Mutual support has been well documented to contributing to personal thriving within group efforts and can be a crucial driver in perseverance and goal attainment (Hektner, 2001). While mutual support is an important behavioural influencer, it is not necessarily associated with prosocial behaviour or *relationally-autonomous* integration. Individuals may feel endorsed when they obtain support from another individual, yet they are not certain to incorporate the others' interests into their own (Gore et al, 2009). Also, access to continuous mutual support together with personal competence and engender long-term, future-oriented outlook in individuals (Gore et al., 2018). For evaluating the degree to which a participant elicited a sense of backing from others, the Hester and Gore statement (2015) was adjusted to interpret data and observations and compare the component in relation to others. The two statements for interpretative analysis were:

> The level to which the participant *experienced* emotional, cognitive or practical support from peers, facilitators or others during the experimental collaboration.
>
> The level to which the participant *felt rewarded* when receiving support from peers, facilitators or others during the experimental collaboration (Hester & Gore, 2015).

Closeness to others describes the need to feel connected with others. In relationships people satisfy their intrinsic desire for relatedness – in addition to competence and autonomy – which can imply the existence of attention and attention to others (Ryan & Deci, 2000). Closeness does afford flexible benefits such as mutual protection and resource sharing. It also fosters social cohesion since the need to belonging is inducive to societal internalisation. This relational assimilation can assure more efficient transfer of knowledge between individual and group (ibid). Research also indicates how individuals who feel a deeper level of relatedness with others are more likely to find tasks they are pursuing to be engaging or interesting. Closeness here is defined by the nature of the lived connection rather than perceived nearness based on entitlement. This means that the energising relatedness is correlated to a degree of intimacy since some relationships with close others can also be distant. Therefore not all people can realise adjustable values in contact with close others (Gore, 2014). For evaluating closeness to others, the Berscheid statement (1989) was adjusted to interpret the data and observations for the level of closeness and prioritise the component in comparison to the rest. The two statements for interpretative analysis entailed:

> The *level of satisfaction* the participant has acquired in the relationships to peers, facilitators or others associated with the study; and,
>
> The *strength of relationships* the participant developed with peers, facilitators or others associated with the study (Berscheid et al., 1989).

In addition to these *relationally-autonomous* existential components, existing research also differentiates the following five *personally-autonomous* components: *Curiosity*, *achievement*, *external rewards* and *social recognition*. These self-determined components can be both intrinsic or extrinsic in nature—internally essential or externally rewarding).

Curiosity is the attention-grabbing desire to know or to learn something (new). It stems from the intrinsic need to find cognitive closure. Desiring a concrete and potentially conclusive answer can be a very powerful motivation since it taps into advancing personal competence

and self-determination. The deep-seated quest for finding answers can be the wellspring for affiliation with others, striving for achievement, or decision-making (Kagan, 1972). In what research refers to as “cycle of curiosity” (Litman, 2005) people who find partial answers, gain preliminary insights, or have ‘early wins’ can feel rewarded, thus continuing to explore the unanswered questions. For evaluating curiosity, the statement was established to interpret the data and observations for the level of attention-commanding curiosity in participants and prioritise the component in comparison to the others. These two statements for interpretative analysis were applied:

> The degree to which the participant *perceives obstacles as exciting* and as opportunity to learn something new.
>
> The degree to which the participant *aspires to learn from others* and to know what is going on.

Achievement refers to the need of an individual for attaining accomplishment, mastering expertise, gaining influence, or reaching higher standards. Achievement can be understood as a process of repeated, durational and determined efforts toward accomplishing something difficult or courageous (Murray, 2008). Typically, achievement is about grit: working hard and purposefully toward a distant goal (McClelland, 2010). For evaluating the sense of achievement, the statement was established to interpret the data and prioritise the component in comparison to the others for interpretative analysis:

> The degree to which the participant puts *importance on improving* the procedures and *reaching tangible results* in this explorative collaboration.

Personal growth entails the coordinated activities that validate and expand a person’s awareness, identity, talents or potential. In what is also referred as “qualified existential life competence” (Sonne & Tønnesvang, 2015) personal growth is a continuously unfolding, dynamic tension between the outward-directed interactions with reality and inward-directed thoughtfulness and perspective-taking (ibid). In effect, this continuous, oscillatory person/world adaptation, enables the person to engage in a qualified, productive way with the sociocultural contexts the person is entering. For evaluating the inclination toward personal growth, the measure was established to interpret the data and prioritise the component in comparison to the others. The statement for interpretative analysis integrated three qualifying aspects:

> The degree to which the participant is (1) *self-aware*, working toward (2) *self-improvement,* and (3) *able to elicit help*.

External rewards are part of hedonic flourishing (6.2) and associated to feelings of positivity acquired through the perceived value from objects, benefits, praise or enjoyment that are deserved, merited or needed (Deci & Ryan, 1996). External rewards are the reinforcers ascribed to behaviours oriented toward external motivational standards. Considered in isolation, extrinsic rewards are considered short-term tokens that can undermine long-term efforts since external rewards alone do not change believe systems that govern demeanour (Kohn, 1995). However, external rewards can positively influence intrinsic, durational pursuits if they reflect the performance of the receiver as affirmation of competence (Deci et al, 2001). For evaluating the responsiveness toward external rewards, the statement was established to interpret the data and prioritise the component for interpretative analysis included:

> The degree to which the participant puts *importance on obtaining a tangible benefit* or external reward (such as the completion certificate) associated with this experimental collaboration.

Social recognition is the feeling of connection through the acknowledgement of personal status or merits, such as achievements, virtues, or services. Contrary to external rewards, social recognition can be energising when it is acknowledging the *efforts invested* rather than the outcomes produced. In this sense social recognition is a form of "cooperation-respect feedback" (Renger et al, 2017) that provides achievement-oriented social esteem. For evaluating the inclination toward social recognition, the statement was established to interpret the data and observations and prioritise the component in comparison to the others for interpretative analysis included:

> The degree to which the participant obtains social esteem from the *respect and recognition of others*.

Controlled components refer to reasons in social functioning that are governed by internal or external *mental constriction* rather than deliberate *mental autonomy*. Controlled components tend to prompt rigid, lesser integrated behaviour which can hamper the energy and mental flourishing in the individual. The person acts from a controlled rather than from a self-coherent disposition (Ryan & Deci, 2000). Lesser integrated means how personal

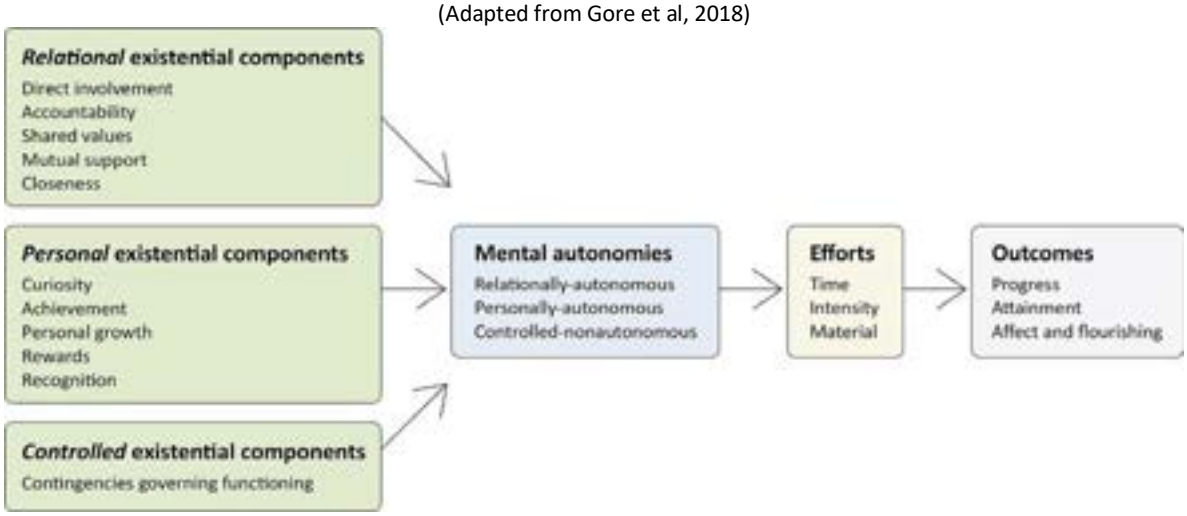
attempts to access competence and relatedness stem from maladapted responses to pressures like guilt, shame, fear, reward expectation, or punishment avoidance, which can undermine their mental autonomy, particularly in the long view (Sonne & Tønnesvang, 2015:142). Controlled components were considered in this study to integrate a broader, more holistic range of existential manifestations. Acknowledging and learning from controlled components therefore is not about judging or correcting people but about providing better support to participants in distressing situations in the spirit of integrative Gestalt practice (Perls et al., 1951; Sonne & Tønnesvang, 2015). For evaluating tendencies of controlling factors, three statements were established to interpret the data and observations and prioritise the components in comparison to the others for interpretative analysis:

> The degree to which the participant feels strongly *obliged to comply* with the demanding situation beyond self-coherent influence.
>
> The degree to which the participant *feels like betraying* peers, facilitators or others if acting alternatively.
>
> The degree to which the participant *feels ashamed*, guilty, or anxious if acting differently.

Controlled components and controlling *demands* are not the same. Controlled experiential components are part of a person's recurring response strategy, they are biographically acquired over a lifetime and can infringe on mental authority. Controlling demands are conditions of resistance or disequilibrium that impinge on mental authority momentarily. In the thriving, organismic reintegration, the individual takes a leap by assimilating or counteracting whereas external pressures can reaffirm self-volition and measured choices.

The existential components outlined in this section constitute elements in an analytical framework to interpret, describe and evaluate the progression of mental autonomies from relational motivation research (Gore at al, 2018). This framework as illustrated in the following diagram (figure 51), contextualises the data interpretation by sequentially correlating the existential components (*green*) with mental autonomies (*blue*), the efforts exerted (*yellow*), and the outcomes displayed (*grey*). The intention is to discern the dynamics that promote relationally committed behaviour by applying the existential components outlined above.

(figure 51) **Framework of existential components in mental autonomies**
(Adapted from Gore et al, 2018)



Integrating relational, personal and controlled existential components into a holistic framework for thematic contents interpretation and analysis.

This analytical framework has thematically guided the phenomenological and empirical content interpretation from this small-group study which cannot claim any degree of representativeness. The study enrolled 22 participants in the six-week collaboration, from which 17 accounts have been interpreted and analysed in-depth. The study entailed a consent form, transcripts from workshop recordings, transcripts from entry and exit interviews, data log from online communications and the self-documentation of participants in form of journal, ad libitum from video documentation, photo documentation, and field notes from home visits.

6.2.4 · Preliminary and hypothetical insights

In the preparatory stage of developing *adventure renderings,* the existential components have been validated, ranked and compared. The results from the five relational existential components – namely: *direct involvement*, *accountability*, *shared values*, *mutual support*, and, *closeness* – were put in relation and compared with outcomes from clinical motivation studies. Due to the experimental nature of the study, social agility – rather than cohesion – was literally the life blood in the existential journeys of the collaborators. Compared to results from clinical studies of transpersonal motivation research that discerns *accountability* as primary existential concern (Gore & Cross, 2006), this study, rather unsurprisingly, prioritises *direct involvement* and *mutual support* as indicated in the comparative listing (table 10).

(table 10) **Importance of existential components in comparison: *Direct involvement* and *mutual support* likely more relevant than *accountability***

Statistically valid, clinical studies (Gore et al, 2006; 2012; 2015; 2018)		Small-group interpretive analysis from study with collaboration in natural setting	
1	**Accountability**	1	**Direct involvement** (34)
2	**Shared values**	2	**Mutual support** (42)
3	**Direct involvement**	3	**Accountability** (45)
4	*Mutual support*	*4*	*Closeness to others (65)*
5	*Closeness to others*	*5*	*Shared values (71)*

Characteristic findings are listed in bold type.

Vital knowledge exchange in adversity endorsed by social buffering: In this small-group study, the key existential components that assisted participants overcoming obstacles were prioritised as *curiosity*, *direct involvement* and *mutual support*. *Curiosity* as the primary manifestation among the personally-autonomous motives, appeared to be the most relevant intrinsic impetus for participants[29]. The proposition of breeding plants simply from one's own urine, apparently unlocked open-ended questions and imaginations. The *direct involvement* with others and *mutual support*, seemed to have participants pulled together through social buffering with agile knowledge transfer. Immediate and multiform interactions were conducive to diffusing learning and social esteem and helpful attention made the shared experience rewarding. In unison, the three existential components appear to have contributed to advancement, expertise and encouragement when the situation required.

this analysis considered both personal and relational components on equal terms. To compare the findings with statistical research in relationally-autonomous motivation, the focus on the respective five existential components is required.

Adversity demands direct involvement, more so than accountability: In clinical research, *accountability* is most strongly prioritised, whereas in this study *direct involvement* was likely most relevant for participants to stay engaged. In similar vein, *shared values*, ranked second in importance in clinical research, appears to be of least relevance for the small-group

[29] Curiosity is not included in tables 10 to 12 since clinical research is focused on relationally-autonomous components and does not include personally-autonomous motives. In contrast, this analysis considered inclusively both personal and relational components.

collaboration. Compared to clinical research, the analysed sample formed around a closed insider group with shared goal pursuit. Participants collaborated in a deliberate way on a given task, committing themselves to a shared mission prior to its start. Naturally, in such self-contracted group, *direct involvement* and *social support* were considered as most essential. It can be assumed that *accountability*, *shared values* and *closeness* were the precondition for participation, therefore less articulated.

Younger demand accountability while older access involvement: Scrutinising for variance among gender and age indicated slight demographic differences as listed below (table 11). In younger participants, the triple-components of *accountability*, *mutual support* and *direct involvement* were likely to be more decisive for persevering in uncertainty. Possibly, younger participants seemed to have a sense of liability toward the facilitators. However, in older participants, the dual-components of *direct Involvement* and *mutual support* seemed to be pertinent for tackling the obstacles together. Obtaining close attention from others was likely more valuable for them.

(table 11) **Prioritisation of existential components by age:**
Younger likely to depend more on *accountability*, older on *direct involvement*

Aged 20-39 years		Aged 40-59 years	
1	**Accountability** (17)	1	**Direct involvement** (15)
2	**Direct involvement** (21)	2	**Mutual support** (20)
3	**Mutual support** (24)	3	Accountability (29)
4	*Shared values* (33)	*4*	*Closeness to others (30)*
5	*Closeness to others* (38)	*5*	*Shared values (41)*

Characteristic findings are listed in bold type.

Women likely to draw on relationships, men on values: Much less accentuated were the differences along the gender line as indicated in the next listing (table 12). For male participants *shared values* appeared to have more primacy than *closeness to others*, while females were likely to appreciate connectivity more. This confirms findings from motivation research that evidenced how women thrive better in relationally-autonomous goal pursuits incorporating the concerns of close others (Gore et al, 2016). Clinical studies show how females socialise from early age in mutually purposeful and shared activities that facilitate

the development of quality relationships (Strough & Berg, 2000). This is opposed to males who tend to obtain accomplishment and dominance in group activities (Rose & Rudolph, 2006).

(table 12) **Prioritisation of existential components by gender:**
Women likely to lean slightly on *closeness*, men slightly on *shared values*

Women		Men	
1	**Direct involvement** (18)	1	**Direct involvement** (19)
2	**Mutual support** (22)	2	**Mutual support** (22)
3	**Accountability** (23)	3	**Accountability** (23)
4	*Closeness (32)*	*4*	*Shared values (34)*
5	*Shared values (41)*	*5*	*Closeness (38)*

Characteristic findings are listed in bold type.

The results of these preliminary tendencies are within the range of expectations. To complement clinical studies with real-world sampling, these preliminary tendencies could be explored much more rigorously in future research. The intention of this study is developing visualisation approaches for understanding failure-resistant collaboration dynamics.

There is a danger in relying solely on the prioritisation of existential components that may put too much focus on structured personhood and "enduring characteristics" (Polster, 1995), rather than the dynamic emergence of selfhood as a process (Sonne & Tønnesvang, 2015:22). The focus of this study is not on quantification and profiling existential states, rather on finding relationships within collaborative enactments and commitment. The factor time is relevant to be able to *render* how mental autonomy is unfolding in the given context. The question is how different types of mental autonomies were expressed over the study period, and how existential components related to participants' efforts and affect.

6.3 · Integrative renderings

The term 'integrative' is used for assembling structural, motivational, cognitive, existential, bodily and interventionist understandings in its analytical framework. Integrative in this sense is about mutual implications for theory and practice in what in Gestalt tradition refers to as "field orientation" (Sonne & Tønnesvang, 2015:18). The phenomenon under exploration is observed at the same time through interpretation of mental-organisational patterns, consciousness for existential-bodily expression, observable interactions, and description of affective atmospheres.

The statements of existential components were applied in this integrative multidimensionality to the data on hand. Yet prioritisations alone cannot represent the existential journey of a person with intentionality who is embedded in context. This ongoing relation-making, boundary-mediating between person and context is in Gestalt practice known as "contact" (Sonne & Tønnesvang, 2015:22). Respectively, this study embarked on a quest to understand this processual contact quality. How a particular person is viewing the world and how it contributes to the experiential trajectory of that individual in interrelation to the situation.

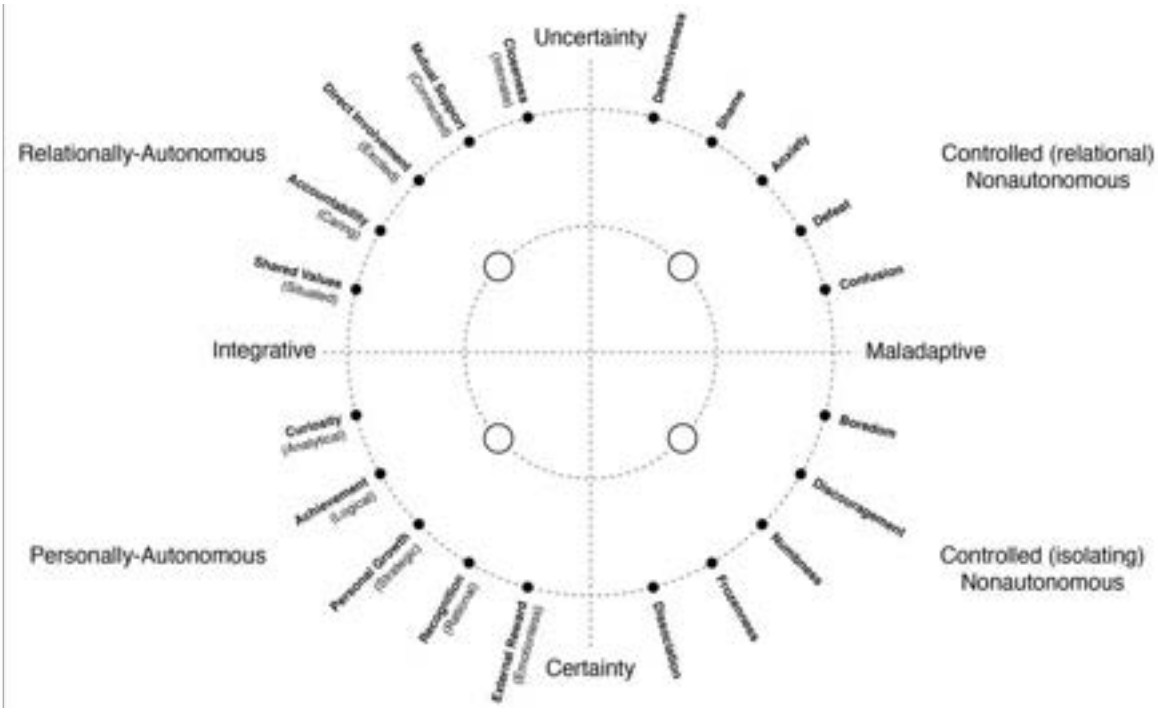
6.3.1 · Rendering existential passages

In collaborative situations, participants are subjected to uncertainly as exemplified in previous chapter. Thus, for making the analysis more integrative, mental authorities (integrating their existential components) needed to be rendered in correlation to uncertainty unfolding. To formulate such a visualisation it was necessary to standardise language and labelling of Herbert Stevenson's (2005; 2016) *integrative autonomy* chord introduced in chapter two (2.2.1).

***Integrative autonomy* chord of existential passages:** Adapting Stevenson's (2005; 2016) *contact model,* the attribution was standardised with the existential components (6.2.3), and complemented with their *controlled* polarities (maladaptive contrapositions). These 20 components were distributed along the chord's circumference to make room for tracing developments across the sectors of mental autonomies as shown in the next chord diagram

(figure 4). In the upper-left sector, the five *relationally-autonomous* components (closeness, social support, direct involvement, accountability, shared values) represent with a balanced sensibility for selfhood and otherness. In the lower-left sector, the five *personally-autonomous* components (curiosity, achievement, personal growth, social recognition, external rewards) are located which gravitate around a strong sense for selfhood (internal authority) and less consideration for external agents. In this sector of self-determination, acting in the world is likely sought from a standpoint of rationality.

(figure 4) ***Integrative autonomy*** **chord:**
Rendering of existential passages on the vulnerability-internalisation juncture
(Modified from Stevenson's *contact model*, 2005; 2016)



Chord diagram for rendering existential components over time: the four dots in each sector represent (from top-left to bottom-right) the autonomous 'points of gravity' defined by Herbert Stevenson (2016) as connected*,* self-loss*,* analytical *and* numbness*. Stevenson's* contact model *this diagram derives from originally was a quadrant map (see illustrated in appendix) which was modified to accommodate temporal fluctuations of existential expressions.*

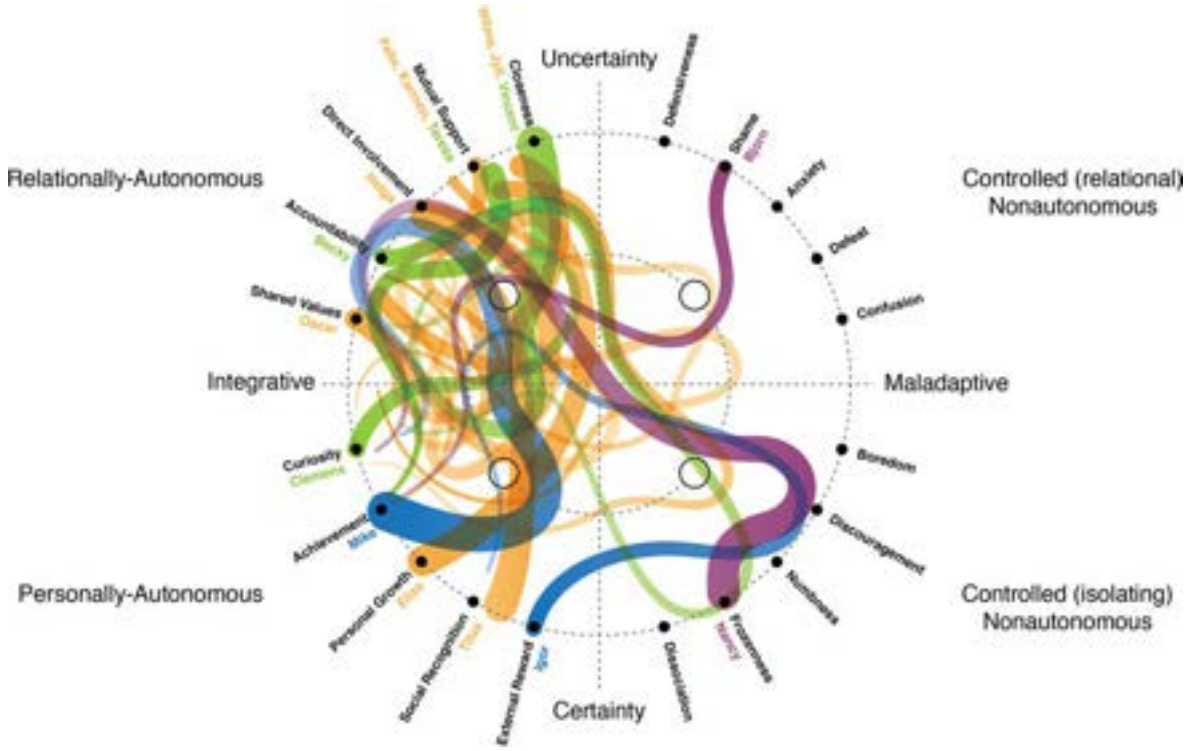
Complementary polarity, not polarisations: The right half of the chord mark the *controlled-nonautonomous* existential components. Each controlled component represents the direct counterpart of its autonomous component on the left half of the chord and positioned diagonally. For example, *direct involvement* is complemented by *numbness*, therefore arranged crosswise on the other side of the chord's circumference. The *relationally-autonomous* sector of well-connected, existential manifestations stands in contrast to the

controlled-nonautonomous sector which entails the isolating existential instances. The *personally-autonomous* sector of rational components is crosswise complemented by the *controlled-autonomous* sector where a reduced sense of internal authority can manifest as imbalance in relation to others (Stevenson, 2016). The purpose of rendering these polarities is not to separate out the poles from each other, but to render the complementary relationship between them. If these polarities are examined separately, then the perception of the person is restricted to dichotomies, and polarities become polarisations. In complementary polarity mental flourishing functions as a dynamic whole, integrating simultaneously multiple polarities (Sonne & Tønnesvang, 2015:39).

Existential passage renderings: Rendering is not to be confused with *mapping*. It refers to the act of scanning rather than pinpointing. It is an approximation of existential dynamics that visually correlates statements of observable instances, affect and efforts of a person in the collaborative context. Such renderings can serve the purpose of recognising patterns, intensities, and breadth without putting impositions on individuals.

Using the statements from the existential components (6.2.3), a thematic-interpretative content analysis has been applied and rendered onto the *integrative autonomy* chord as existential passage on the vulnerability-internalisation juncture. This passage is represented by a stroke with colour gradient where the brighter end indicates the beginning, and the darker end the ending point of participation. Depending on the intensity of participants' efforts and involvement, the stroke is rendered with thicker or thinner width. Longer and winding strokes indicate more expansive and eventful existential passages in relation to incidents, interactions, responses, and decisions. Having the existential components rendered over time, they can now be considered *existential passages* as illustrated in the next chord diagram (figure 52).

(figure 52) **Existential passages of 17 participants on *integrative autonomy* chord**



Chord diagram with renderings of existential sequences *from observable acts, affects and efforts in collaborators: the colours distinguish their autonomous trajectories.*

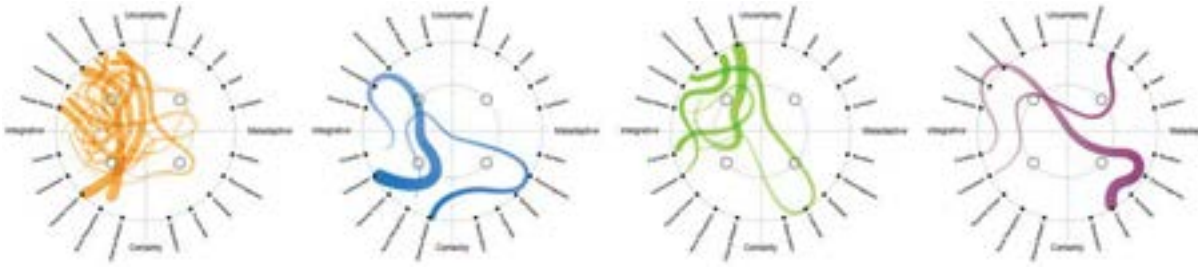
Relationally-autonomously integrated group: Above all 17 vulnerability-internalisation passages are superimposed into one chord diagram. It shows a clustering of strokes in the left-hand semicircle, indicating that most collaborators' existential passages have unfolded in the autonomous spectrum. Participants were able to engage with unpredictability in ways that were self-affirming. Most passages have their starting and ending points inside the upper-left sector indicating that collaborators were likely well integrated with themselves and the group. The integrative autonomy chord also renders a few outlier passages where experiences seemed less integrated. The colour hues distinguish four different types of vulnerability-internalisation journeys that manifested in the study:

- ***Orange*** *(1)* indicates experiential journeys which began and ended in the *relationally*-autonomous (well-connected) sector;
- ***Blue*** *(2)* represents passages which remained in the *personally*-autonomous (rationally self-determined) sector from start to finish;
- ***Green*** *(3)* renders experiential transitions where collaborators started out *personally*-autonomously and gradually shift into the *relationally*-autonomous range (from rational to connected); and,

- ***Purple** (4)* traces experiential transitions where individuals entered the project from decidedly strong rational or connected dispositions and drifted into controlled, lesser integrated tendencies (from rational/strong to maladaptive).

Autonomous (1/2)**, transitioning** (3)**, and controlled** (4) **passages:** By comparing what autonomy sectors the participants have entered and exited the study, as well as traversed between, their existential passages can be differentiated as shown in the next graphic (figure 53). Nine out of the 17 existential renderings (*orange*, 1) are representing experiences where participants were able to stay well connected without losing sight of their own needs. Two participants (*blue,* 2) appeared to remain more analytical throughout the project. As for the six *transitional* passages, four collaborators (*green,* 3) shifted from a more self-determined toward a transpersonal integration in response to unpredictability while two others (*purple,* 4) seemed to have wound up in more isolating positions.

(figure 53) **Four distinct patterns of existential passages**



Chord diagrams with four existential patterns: from left to right, transpersonal (orange: 9 participants), self-determined (blue: 2 participants), relationally-transitioning (green: 4 participants) and controlled-transitioning (purple: 2 participants).

The passage renderings make apparent how in all four patterns of vulnerability-integration, there are significant variations in intensity of interactions, indicating that there is likely no direct link between efforts invested and well-adaptation. Comparing the lengths of passages, the relationally-autonomous journeys (*orange,* 1) tend to be shorter and more concentrated, while the lesser integrated passages (*purple,* 4) tend to be much longer. This is visual indication how in relationally oriented passages the energising momentum likely oscillated between *direct involvement* and *mutual support*. On the other side, in the more lesser integrated range (*purple,* 4), the passages likely entailed complementary bringing forth partially maladapted existential manifestations.

Integrative transitions likely from multiform engagement with others: The aspect that differentiates the *green* passages (3) of more integrative transitions from the others is their curvy, windy and multi-directional trajectory. This may indicate how each collaborator presumably was able to respond in their own way to the unpredictability presented. It likely means that the four participants have transitioned from a self-determined to transpersonal stance for their own reasons. What sets these passages apart from the others is the importance put on *closeness to others* and *personal growth*.

These renderings could indicate how participants were able to relate to close others but also how specific exchanges have contributed to extra sensemaking. Integrative transitions with close others could be considered for example 'conspiring together' with one's spouse when appropriating the faulty contraption design (Teresa), self-critically scrutinising own performance in relation to peers (Becky), initiating group access through spontaneity (Clements), or confessing personal dilemma with facilitators (Vincent). The four passages of integrative transitions (*green,* 3) likely were the result of interstitial openings, like conspiring, confabulating or confiding. In comparison, the two passages with less integrative, more isolating transitions (*purple,* 4), appeared to have relied more on *shared values* by seeking close association to the subgroup (Nancy), or obtaining status through notoriety and identification (Bjorn).

Comparing the existential components as shown in the listing below (table 13), noteworthy are the varied prioritisations in the transitional passages. While *closeness to others* and *personal growth* were ranking high in relevance for participants who shifted from self-determined to relationally-autonomous inclinations (*green*, 3rd column), *shared values* together with *social recognition* and *achievement* appeared to have been more pertinent in the controlled-transitional passages (*purple*, 4th column). The enlisting of *social recognition* in addition to *external reward* makes this lesser integrated subgroup more dependent on extrinsic components.

In comparison, the relationally-autonomous passages (*orange*, 1st column), did not register any extrinsic components, and rather relied on transpersonal and self-determined components like *mutual support*, *curiosity* or *personal growth*. It confirms research that indicates how extrinsic needs tend to predict less commitment and reduced personal

flourishing (Deci & Ryan, 2000a). As for the more consistently self-determined passages (*blue*, 2nd column), it comes to no surprise that *achievement* outranks all other existential components.

(table 13) **Characterising four existential passages in relation to measurable efforts and observable mental flourishing**

Relationally-autonomous (9 participants)	**Personally-autonomous** (2 participants)	**Relationally-transitioning** (4 participants)	**Controlled-transitioning** (2 participants)
Relationally-autonomous existential components			
1- Direct involvement **2- Mutual support** 3- Accountability 4- Closeness to others 5- Shared values	1- Accountability **2- Direct involvement** **3- Mutual support** 4- Shared value 5- Closeness to others	1- Direct involvement **2- Closeness to other** 3- Accountability 4- Shared value 5- Mutual support	1- Direct involvement 2- **Shared values** 3- Mutual support 4- Accountability 5- **Closeness to others**
Personally-autonomous existential components			
1- Curiosity 2- Achievement **3- Personal growth**	**1- Achievement** 2- Curiosity **3- External reward** 4- Social recognition	1- Curiosity **2- Personal growth** 3- Achievement 4- Social recognition	1- **Social recognition** 2- **Achievement** 3- Curiosity 4- External reward 5- Personal growth
Measurable efforts in collaborative study			
40.0 days task active 47.5 days engaged 26x group contact 9.0x facilitator contact 93% workshop	32.0 days task active 65.8 days engaged **44x group contact** **23.0x facilitator contact** 100% workshop	28.6 days task active 55 days engaged 21x group contact 8.5x facilitator contact 100% workshop	32.0 days task active 28.0 days engaged 21x group contact **4.0x facilitator contact** 90% workshop
Observable attainment, enjoyment and flourishing			
• Reassertive • Other-sensibility • Shared enthusiasm	• Influencing • Agential	• Confessional • Humourous • Reconstituting self-worth	• Apologetic • Discouragement • Surrender • Sacrificial devotion
The four passage patterns correlated with existential components and observable, measurable outcomes: characteristic findings are indicated in bold.			

Flourishing in adaptation, transpersonal leap, and seclusive strategies: Passage-rendering the data via existential components revealed how personal success rationale is relevant for ensuing engagement, effort and affect. Interesting here is how among both, the personally-autonomous (*blue*, 2nd column), and controlled-transitioning passages (*purple*, 4th column) the desire for *tangible outcomes* seemed most relevant for why people persevered. The crucial difference lies in the degree of efforts invested. In the personally-autonomous passages (*blue*), participants appeared to be intrinsically driven, so much so, that they self-initiated the highest level of contact with peers and facilitators. Presumably, avid interaction was vital for getting a sense of advancement. Such a relationally engaged goal pursuit for primarily personal gains. In contrast, in the controlled-transitioning group (*purple*), the instances of contact were the lowest.

Notably, measurable efforts cannot equally reflect the level of engagement across different passage patterns. Among the group of relationally-transitioning participants (*green,* 3), a number of participants were more of the introvert type, therefore some appeared less engaged, particularly in the first part of the project. More validity is in the task-active days, which is the total time spent on the daily homemaking assignments. In the relationally-autonomous passages (*orange,* 1) people seemed most committed to fulfill their daily tasks.

In regards to affect and enjoyment, participants' ability to configure the group has likely made a significant difference in mental flourishing. In controlled-transitioning passages (*purple*), the group was likely addressed for seeking self-approval, for example in form of incessant apologies. Engagement here seemed rather constricted and less enjoyable. In the relationally-autonomous (*orange,* 1) and relationally-transitioning passages (*green,* 3), people elicited positive affinities by approaching the group consensus forum. *Direct involvement* here may imply the shared sensemaking and decision-finding assisted by spontaneity with humour, assertive circumspection, or personal revelation.

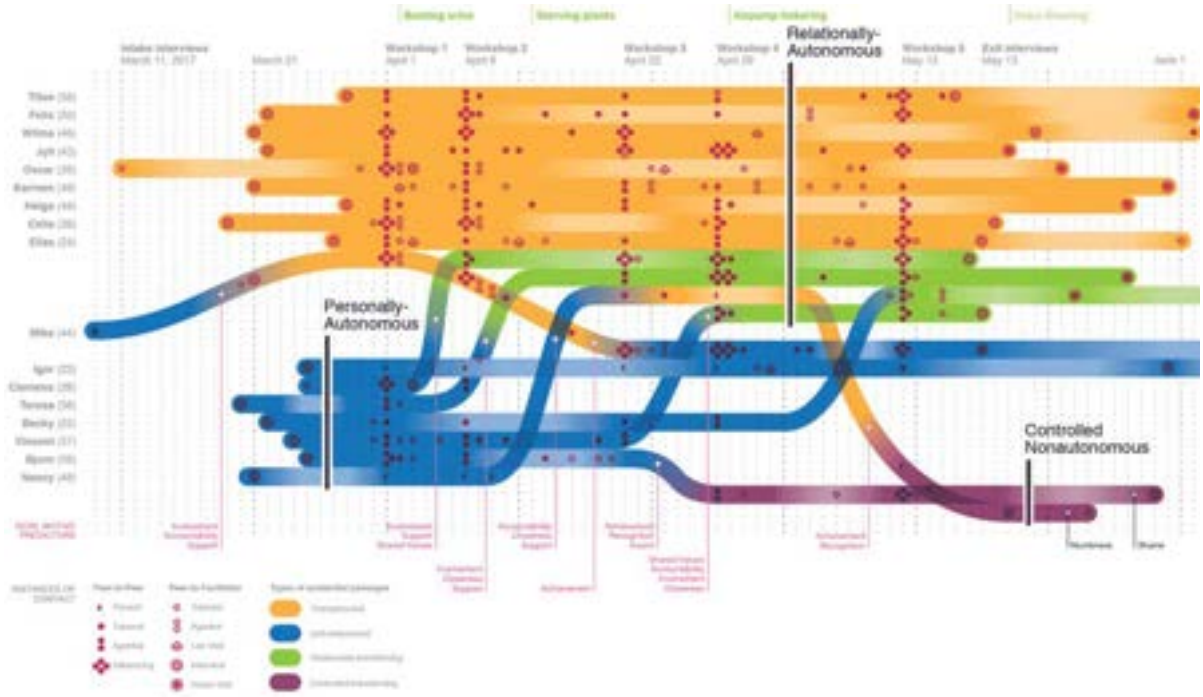
The renderings of the *integrative autonomy* chord have limited accuracy since the existential statements and framework emerged from the analysis after the study. Applied already *during* the study, the chord diagram could serve as conversation guide where participants and facilitators establish the renderings of mutual passages *together* in relations to the unfolding experience. Using this vulnerability-internalisation rendering can assist to gain more clarity on the adaptive and connective strategies in participants in relation to the given situation. The diagram can assist to discover interaction dynamics early in the collaborative process and bring insight for shared coping strategies for failure-friendly settings granted analytical measures and scales are in place.

6.3.2 · Rendering existential timeline bundles

Collaborative experiences do not take place in isolation, they are part of contingent interactions. The limitation of the *integrative autonomy* chord (see 6.3.1 above) which attempts to superimpose and combine the experiential passages of all participants, is their displacement in the time space. For the sake of more integrative rendering, the existential passages needed to be pulled out of the closed realm of individual mental autonomies and contextualised *in the field* where lives, structures and interactions converge. To relate the

existential passages into the context of group exchanges, they were displayed on a timeline with a Sankey diagram. Rendering existential passages as timelines and bundling them into their four autonomous streams, the durational efforts and interaction points could be better appreciated or compared as illustrated in the following Sankey diagram (figure 54). A larger version thereof is featured in the appendix.

(figure 54) **Existential passages bundled into timelines of interactions**



Sankey diagram with four patterns of existential passages of transpersonal (orange), self-determined (blue), relationally-transitioning (green) and controlled-transitioning (purple) in relation to events, encounters and interactions.

Above the coloured timelines, the text labels in *teal* indicate the *unplanned* events, the text in grey marks planned events with start, horticultural phases, workshops and ending. Each timeline represents the passage of one participant and their trajectory within or between the four mental autonomy streams. Adopting the colour scheme from above, the timelines in *orange* indicate transpersonal passages, *green* are relationally-transitioning journeys, *blue* are self-determined, and *purple* represent the controlled-nonautonomous passages. The lighter gradients in the timelines indicate less interaction with peers or facilitators. Beneath the timelines, the text labels in *magenta* indicate existential instances that influenced the behavioural responses. The dots and circles in *magenta* inside the timeslines identify the degree of involvement as it was observable and recorded.

The bundled timelines show how most relationally-autonomous passages (*orange*) were continuous and remained in the transpersonal, relationally-autonomous stream. In contrast, most personally-autonomous timelines (*blue*) started out in the self-determined before transitioning into the transpersonal (*green*) or controlled-existential timelines (*purple*) streams. Two timelines stand out. The *blue*, left-most timeline shows the passage of a highly self-motivated collaborator (Mike) who is extremely prosocial in the first half of the project. When the experiments technically falters and the original goals can no longer be attained in the latter half, the passage transitions back into the personally-autonomous stream. The very bottom timeline renders a passage that presumably has touched on three types of streams, from self-determined into relational to eventually drift into *controlled* existential waters. It indicates a passage with significantly fewer instances of involvement points. Presumably this timeline was bounded in obligations that detracted from partaking and benefitting from group life.

Considering the instance of contact points, it is noticeable how the workshops were catalysts for transitioning from one autonomy stream to another. In particular workshop one (April 1) and workshop four (April 29) apparently provided important triggers and support for participants to take the plunge and transition into more relationally-autonomous waters. These two workshops also took place when adversity was most acute vis-à-vis urine explosions and plant starvation.

The Sankey diagram visualises the importance of peer-to-peer interactions above and beyond exchanges with facilitators. It also represents how peer-to-peer and peer-to-facilitator interactions are steadier and recurrent among the relationally-autonomous collaborators (*orange*). There are also more frequent interactions occurring between the workshops through digital exchanges. In this relationally oriented stream, participants were most likely to invite the facilitators to a home visit—a signifier of trust in this particular cultural context.

So far, this analysis has rendered existential passages correlated to time, events and interactions. It assisted in discerning transitioning points and patterning. It linked flourishing dynamics in the group to given moments. Yet, for acquiring a deeper understanding on participants' mental flourishing, the renderings needed to reach beyond autonomy patterns

or streams and consider the developments in complementary polarities (6.3.1) comprising these existential passages.

6.3.3 · Rendering existential aggregates

The sequencing of mental authorities in existential internalisation chord and timeline bundle above is limited in representing participants' inner adaptive developments in response to outer conditions. Instead of one-dimensional renderings that run from start to finish, an open diagrammatic structure can be more conducive to rendering the dynamic interrelations of existential components present at any given instance. Such an open-frame model would allow to put the propensities of existential components in relation to the person's individual preposition, efforts and outcomes. This modelling approached the cumulation of existential adaptation and annotate it within the context.

Following the idea of "reflective practice" by Donald Schön (1982) and Ranulph Glanville (2009), the analysis emerges from a continued conversation the researcher is holding with oneself – to engage others! – through the rendering with pencil and paper (transferred into computerised vector drawings for wider reach). Through the resistance of the pencil on paper (or, trackpad onto screen), the researcher attempts "to indicate a simple way of making marks" (Glanville, 1999:88). The points and vector paths featured in this chapter are therefore part of a reflexive conversation between researcher and psychodynamic data on hand. Each rendition of diagrams is trying to add a mark to better understand the situation and develop a more interrelated perspective of reciprocal aspects.

So far, this analysis drew from motivation research and coaching practice to make sense of the dynamics of behaviours on the juncture of mental autonomy and generative vulnerability[30]. The final mark-making is an attempt to synthesise existential development into an complementary model of existential dynamics that represents the person as their own self-enabler who is exerting internal control, and self-coherent responsibility (Sonne & Tønnesvang, 2015)

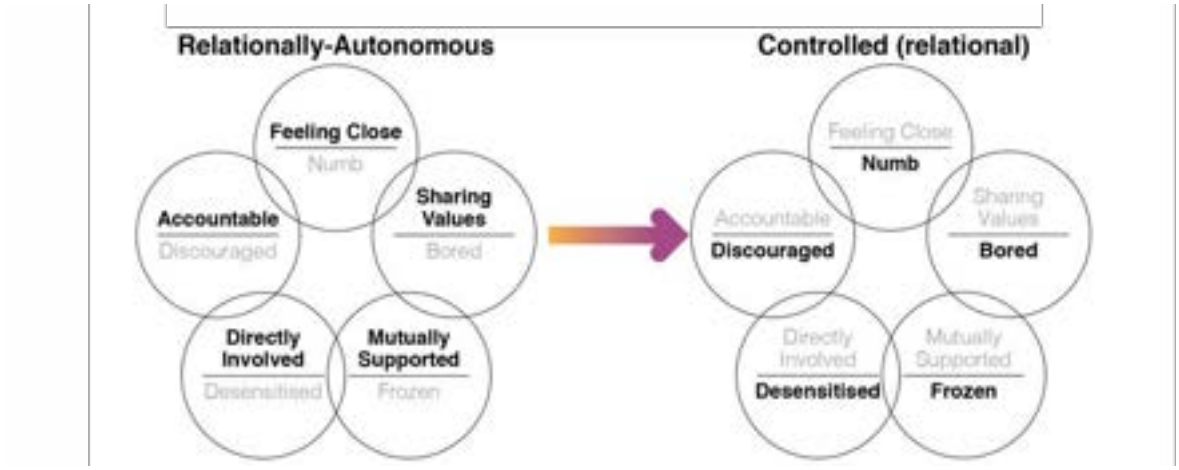
[30] On the integrative autonomy chord (6.3.1) mental autonomy is related to the response spectrum between internal and external authority, whereas generative vulnerability relates to the response spectrum between intimacy and isolation.

6.3.4 · Rendering existential polarities

Rendering more comprehensive existential constellations, thus, takes into account the contrapositions of both, autonomous and controlled autonomies, since each existential aspect is depending on each others. In such a configurative approach, the realms of autonomous and controlled mental integration can be consolidated into a rendering. Also lesser integrated existential manifestations can be – with adequate support – the basis for enduring, prosocial commitment. In this integrated approach, for example the contraposition of *curiosity* with *confusion* becomes a figure/ground—the multistable configuration (2.1.3) that can transcend dualistic existential states into a revelatory suspension between the person and the situation (Schuppli, 2016; Sonne & Tønnesvang, 2015). For this purpose, the experiential renderings were aggregated in three steps.

In step one, the five relationally-autonomous components are complemented with their five 'controlled' contrapositions and consolidated into a single Venn diagram. This polygonal configuration consolidates now in one sphere the relational-autonomous expression in the upper half and its controlled-isolating polarity in the lower half. The resulting five autonomy-nonautonomy contrapositions for the transpersonal aggregate are: *closeness to others/numbness*; *shared values/boredom*; *mutual support/frozenness*; *direct involvement/desensitisation*; and, *accountability/discouragement*. To keep the labels concise relatable, the nouns of the existential components were replaced with their respective adjectives. In the Venn diagram (figure 55) below, the *orange* hue in the gradient of the arrow, indicates the transpersonal, the *purple* hue the controlled position of the configuration.

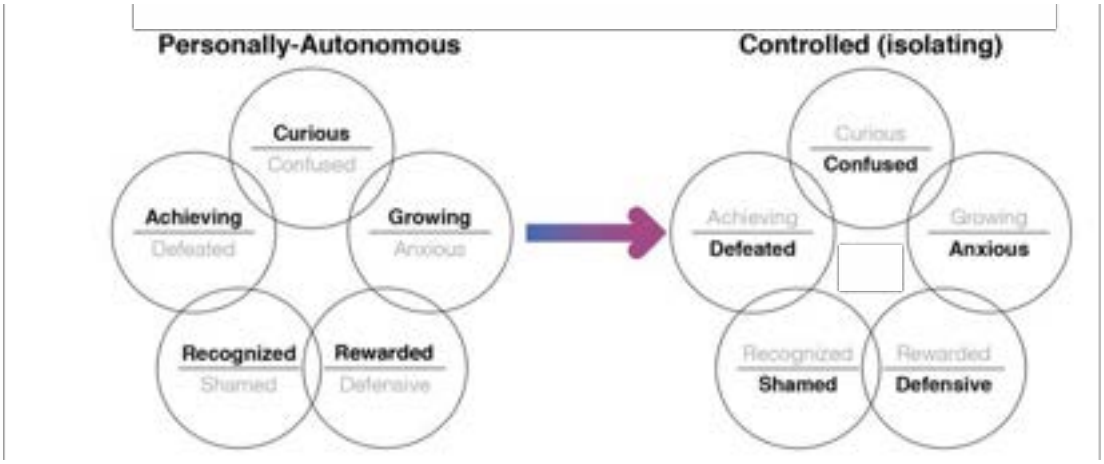
(figure 55) **Transpersonal aggregate consolidating existential polarities (contrapositions)**
(Existential composite rendering: step 1/3)



The first consolidated Venn diagram results from five circles in pentagonal configuration and consolidates all ten relationally-autonomous components: Each sphere brings together two complementary existential polarities with the autonomous *counterpart in the top half (e.g. 'Feeling Close') and the* controlled *counterpart (e.g. 'Numb') in the bottom half.*

In step two of aggregative rendering, the five personally-autonomous (self-determined) existential components are configured with their five 'controlled' polarities and consolidated into the second Venn diagram. The resulting five autonomy-nonautonomy polarities for the self-concordant components are: *curiosity/confusion*; *personal growth/anxiety*; *external reward/defensiveness*; *social recognition/shame*; and *achievement/defeat*. In the following Venn diagram (figure 56) below, the *blue* hue in the gradient of the arrow, indicates the self-determined, the *purple* hue the controlled position of the configuration.

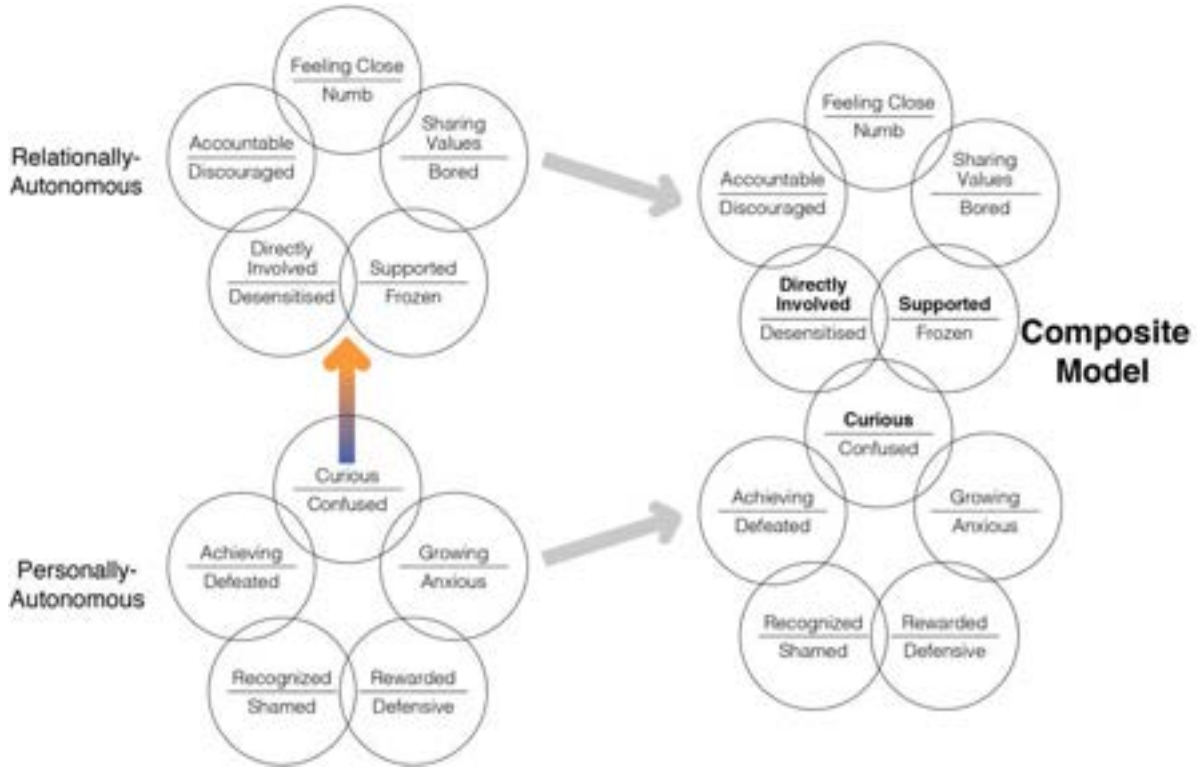
(figure 56) **Self-determined aggregate consolidating existential polarities**
(Existential composite rendering: step 2/3)



The second consolidated Venn diagram results from five circles in pentagonal configuration and consolidates all ten personally-autonomous components: Each sphere brings together two complementary existential polarities with the autonomous *counterpart in the top half (e.g. 'Curious') and the* controlled *counterpart (e.g. 'Confused') in the bottom half.*

Step three completes the *existential composite rendering* by conjoining the two Venn charts as shown below (figure 56). With the *transpersonal* aggregate on top and the *self-determined* aggregate below, they can be rotated so that the three existential polarities of *direct involvement*, *mutual support* and *curiosity* are forming an inverted pyramid (upside-down triangle). The preliminary analysis (6.1 and 6.2) indicated the pivotal influence of *direct involvement*, *mutual support* and *curiosity* helped collaborators persevere. *Direct involvement* and *mutual support* represent relationally-autonomous components while *curiosity* was the prioritised personally-autonomous component in the study. Docked in this constellation, the polarity of *curiosity/confusion* is now the pivot of the inverted pyramid in the centre of this composite. In this way it represents the entry point since *curiosity* had pulled collaborators into study.

(figure 56) **Composite model from transpersonal and self-determined aggregates**
(Existential composite rendering: step 3/3)



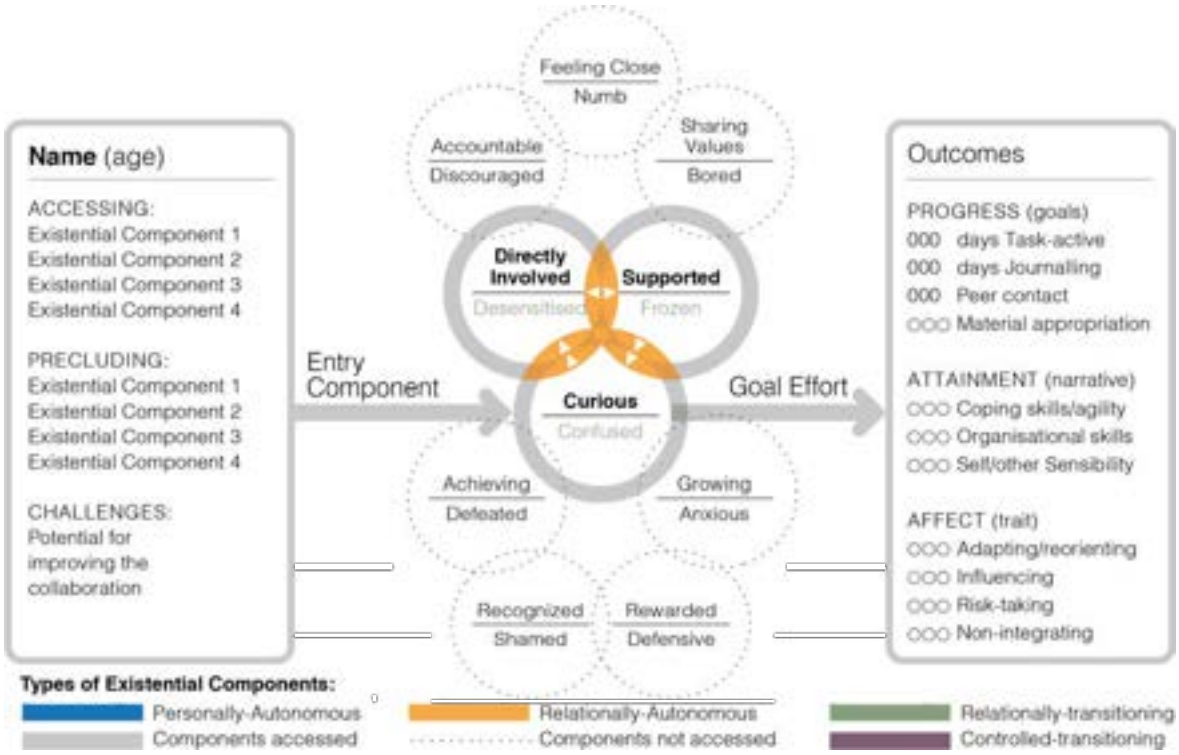
The third and final Venn diagram results from conjoining the personally-autonomous aggregate (self-determined existential polarities) with the relationally-autonomous aggregate (transpersonal existential polarities) into the composite model with the 'Curious'/'Confused' as the pivotal hinge in the chain of components.

The inverted pyramid (centre) with the existential polarities of *direct involvement*/*mutual support*/*curiosity* has been consistently resourced by participants in response to adversity. In the given constellation, the existential polarities of intimacy and non-feeling (closeness to

others/numbness) are atop, and rationality and exposedness (social recognition/shame and external reward/defensiveness) are bottom-most in opposition to each other. The existential components appear in Stevenson's original *contact model* (2016) in diagonal opposition. Here they are collapsed into aggregative polarities where the undercurrent tension between them, can contribute to a more dialogical evaluation.

Over the course of a collaborative situation, at various intervals, the existential polarities can be marked and connections between them traced. The existential aggregate is flanked by an inventory box (left) for participants' prepositions, and observable outcomes (right) as shown in the next graphic (figure 58). Outcomes can be defined by work progress, attainment of expertise, and displayed affect in the interactions with others. 'Observable' indicates phenomena related to the entirety of a person's presence, from task-related artefact, content analysis and body language. By marking the components of existential polarities that have been accessed, and rendering their interrelations, facets of mental flourishing can be uncovered.

(figure 58) **Rendering existential aggregates with composite model**



In this cluster of the existential polarities, links between mental autonomy and controlledness can be marked up and put in relation to observable prepositions and outcomes: the inverted pyramid of direct involvement/mutual support/curiosity in the inner core, were the existential components most relevant in the precarious study.

The composite model above can be considered the baseline aggregation that is never attained in real life. On the following pages, the *experiential composite model* is applied and tried out to trace the existential polarity dispositions of eight participants. These visualisations are referred to as *adventure renderings* because they mark the personal itineraries of existential developments in response to the given situation. The aggregated polarities of this model try to invite reflecting-in-marking to impart spontaneity and flexibility so crucial to experimental collaborations.

6.4 · Flourishing under unpredictability

Through the following eight *adventure renderings*, three main areas will be explored and compared to build perspective awareness into the dynamics that can assist or hinder people in learning and growing in adversity:

A · Adjustment styles: How were collaborators responding to the challenges presented and what were the person's characteristics in processing and interacting with these critical moments. This concerns the improvement of support strategies.

B · Personal development: What aspects in the collaboration presented potential for personal self-validation or growth and what factors supported learning outcomes in participants? This concerns the fostering of mental autonomy.

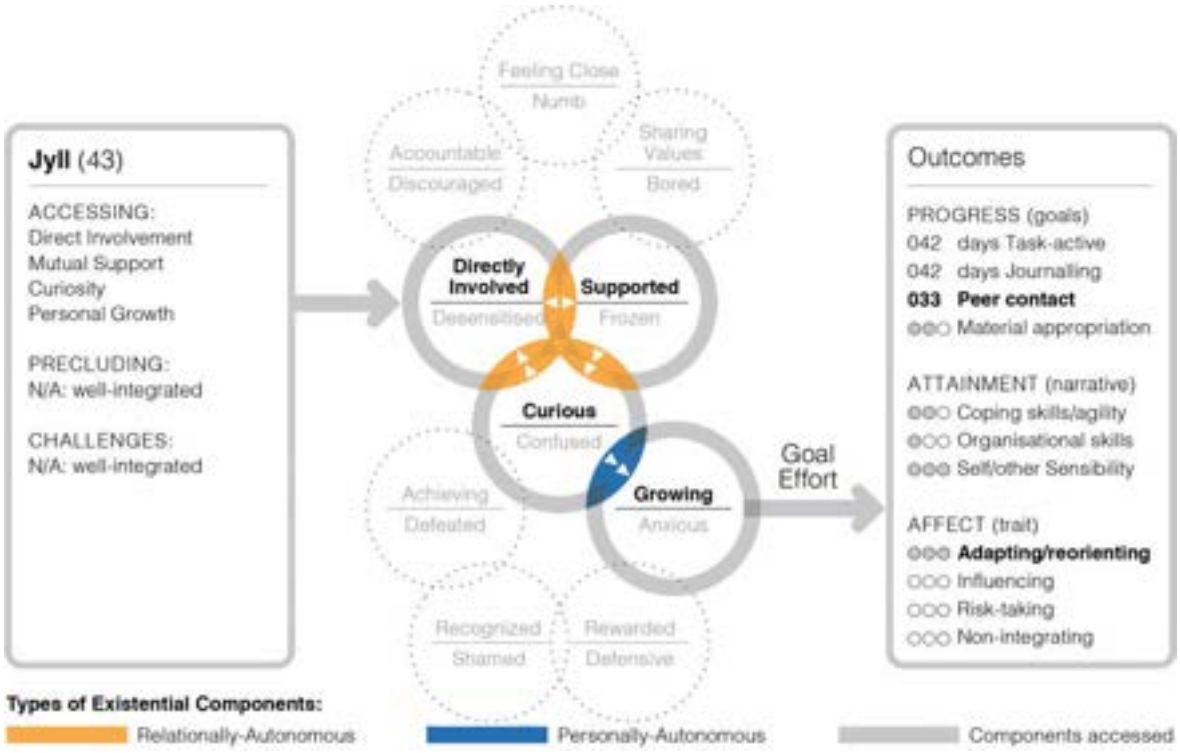
C · Confronting limitations: How do persons engage with their boundaries, and to what degree can this model bring criticality to the collaborative process. This concerns the grasping of learning opportunities vis-à-vis failure.

6.4.1 · Eight *adventure renderings*

From the documentation material of a total of 22 participants, the data 17 was sufficient for triangulation and analysis while the interaction logs from five others were not substantiated enough to evaluate their experiential journey. For variance, the eight most characteristic journeys are presented for testing applicability of the *existential composite model* and elicit insight on collaborative dynamics.

Since mental adjustment to experimental collaboration is evaluated, the eight analytical explorations are termed *adventure renderings*. Adventure here is understood as probing boundaries of personal conduct in supported setting. The first two *adventure renderings* as shown in the next two aggregates (figures 59 and 60) represent the existential renderings evolving closest to the baseline polarity of *involvement-support-curiosity*. The latter renderings are gradually deviating from that paragon.

(figure 59) **Adventure rendering 1: Thriving in adversity via group buoyancy**



The communal homemaker: In this journey of a well-integrated collaborator, the momentum originated in the group involvement from start to finish. The overlap in curiosity and personal growth reveals how Jyll's preposition as an active organiser of communal urban farming, makes her participation both a continuum of her personal trait and extension of her aspiration as community organiser and educator (orange indicates relationally-autonomous and blue the more self-determined existential components).

A (1) · **Adjustment with relatable others makes process enjoyable:** For Jyll (43), being together with 21 peers who share interests and coordinate their daily routines toward a greater mission was fascinating in itself. It meant to be part of a temporary, buoyant group with broad expertise that could be trusted would guarantee some kind of supportful outcome. Throughout all stages, Jyll made herself available and contributed actively to the exchanges since she was interested to open up learning potentials and add to her experience as a community garden organiser, educator and person. Jyll took initially the project very seriously and eventually relaxed her efforts after 32 days when the system

proved inferior in growing plants. Yet she remained fully engaged in the group life and felt supported by the continuously positive affinities among its members. Deriving joy and meaning from direct involvement made her forgive the technical shortcomings, staying courteous and cooperative throughout the challenge.

Reducing personal expectations, finding alternative approaches, and focusing on the shared narrative (rather than immediate disappointment) made her experience count. Jyll mentioned how each workshop felt like weekly reconvening with 'basecamp' that invigorated the self-responsible experimentations at home. She also mentioned how this communal experiment interlinked home routine with explorative openings and insight, sparking the desire to integrate a wider public.

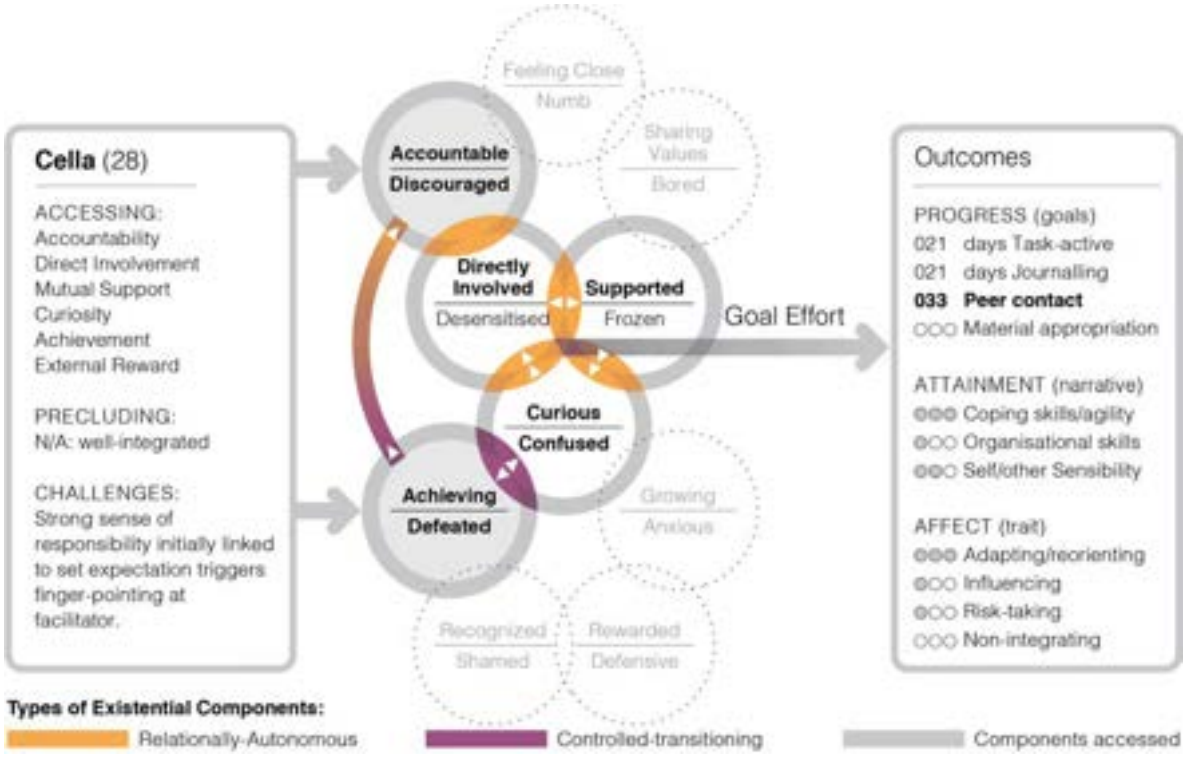
The affective atmosphere in the group, the unequivocal engagement amidst peers with complimentary expertise, and the purposeful container of a social adjustment venture, likely contributed to the relationally-autonomous dynamic here.

B (1) **· Growth in nourishing affective group atmosphere.** As permaculture practitioner and organiser, Jyll is and well versed to handle setbacks while keeping an eye on the bigger picture. The study's shortcomings made Jyll focus on what worked well—the activating, failure-friendly collaborativeness (previous chapter, 5.4). In the face of obstacles, contributing to the group effort has been rewarding for Jyll. Finding an affectionate climate with what she calls "positive people" [exit interview, Jyll] she is able to access help and support and intensify her engagement over time. Even her gardening competence has has benefitted from experiencing the challenges of water-based planting by appreciating the advantages of soil-based horticulture. Being not alone, but in a shared struggle with peers, her own was buffered because she was able to witness and derive support from the manifold ways of countering the challenge. This recurrent contextualising of one's own quandary in relation to others, kept her relationally engaged. Jyll was able to derive enjoyment from a group effort without any guarantees, because the study was congruent with her personal trait, narrative and larger life objectives.

C (1) · **Rendering of an amicable proponent relationship.** The paths of Jyll and the researcher have crossed before the study on several, composting-related occasions. Similar to the researcher's intention, Jyll is interested in communal rearrangements for local food cultivation. Her participation was biased toward the benefit of the researcher and invigorated by the larger cause. This made her respond favourably. Instead of focusing on the cause of the problems, she contributed to mutual support—socially, functionally, emotionally. Jyll had a stake in the welfare of the group and deemed the affective collaborative climate as accomplishment in itself.

That opens the question what the experiential dynamics were for another amicable collaborator who is also more scientifically and rational oriented, as shown in the next graphic (figure 60).

(figure 60) **Adventure rendering 2: Relational reorientation from reframing success rational**



The bioscience homemaker: In this journey of a reintegrating collaborator, the impetus in collaborating changed in the course of the venture. Initially, a strong desire to find achievement (as Beta-tester) was disappointed, triggering a shared sense of accountability toward the group that became an worthwhile obligation in itself. Shifting from her focus from personal goal to shared narrative helped reappreciate the purpose of the venture (orange indicates relationally-autonomous and purple the more controlled existential components). The dual-activated 'Achieving'/'Defeated' sphere marks the initial disappointment about the inferior technical set-up. Together with the feeling of being 'Accountable'/'Discouraged' this led to a brief discomfort discharge (blame) toward the sloppy facilitators.

A (2) · **Adjustment by 'downgrading' from Beta to Alpha tester:** After pointing out how the apparent lack of preparations are short-changing fellow participants, Cella (28) was releasing briefly her discomfort in private exchange with the researcher. Indeed there was a lot that the facilitators could be blamed for: inferior product, uncontrollable scientific set-up, and largely untested procedures, implicating them as Alpha testers rather than citizen scientists. Yet, Cella was quick to comport herself and alleviate blaming by focusing on the developments in the group. Being forward-oriented, she felt pity and compassion for the extra trouble caused in her peers. Appreciating the dedication of others, learning from their needs and proactively contributing to knowledge support, she was able to elicit new meaning to this endeavour. While she regretted how the study downgraded her peers to Alpha testers, she felt solidarity with them and volunteered attention, knowledge and goodwill to the group. Cella integrated the wayfaring of her peers into her goal motive and narrative. The vertical bowline (*orange-purple* gradient) between two spheres indicate the dynamic that occurred when disappointment from the technical underdelivery triggers at the same time discomfort and resolve by oscillating between the polarities of *accountable/discouraged* in the uppers aggregate and *achieving/defeated* in the lower aggregate of the adventure rendering.

Due to the system's inefficiency, Cella "took it easy" [exit interview] after 32 days and ceased the daily tasks. Thereafter her study's contribution focused on the weekly workshops that offered a direct experience in relation to others. As a savvy home gardener and fermenter, Cella finds her own agroecological outlook strongly reflected in this study. The meaningfulness of pursuing the outlined goals in the Hong Kong context was stronger than her dissonance regarding the experiment set-up. The affective group atmosphere and a shared sense of discovery this distinct social experimentation engendered the relationally-autonomous dynamic.

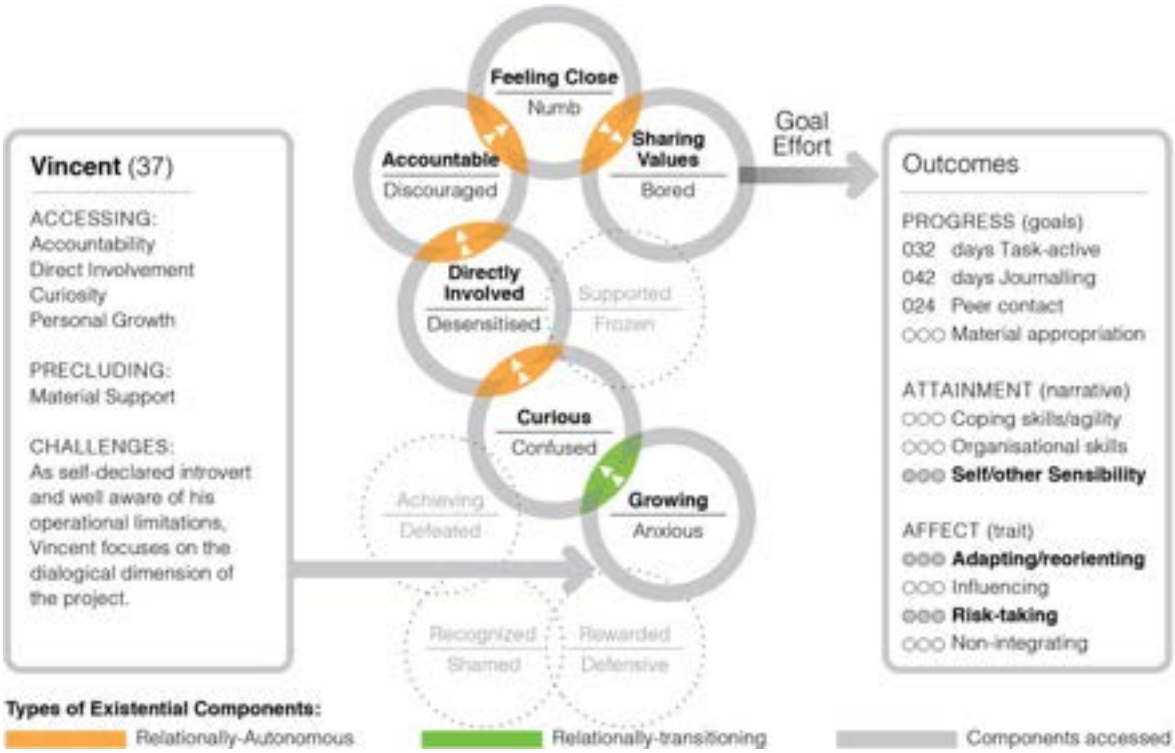
> The success rational shifted from correcting a doomed cause to assisting others in coping. Cella was able to appreciate the venture for what it was, an unusual, "brave experimentation" that could bring about accelerated learning from the group [exit interview, Cella].

B (2) · **Growth from self-interception and reintegration with group:** As natural scientist, the technical failure had an explainable, rational cause: the facilitators' ill-preparedness. Despite, Cella did not abandon ship but was intrigued how peers engaged with this persistent incompleteness. Taking the leap from result-orientation to process enjoyment, meant that Cella incorporated the interests of peers into her own. Growth was about making room for group and collaboration to unfold to potentially form new connections. Cella found it energising how 21 peers shared the same goal of concurrently fermenting their urine for growing plants. Her life partner at home was disengaged from the undertaking, so peer support was vital. In the least, the study likely has fostered, other-appreciation, observation skills, self-reflection and patience tolerance. Eventually, this reintegration would pay off in productivity terms too. One year after completing the study, the annoying algae infestation of the failing system, would inspire Cella to scale it up into veritable algae reactors used them as air cleaners in educational projects.

C (2) · **Rendering of critical proponent friendship:** Cella and the researcher have been friends for several years, endorsing each other's fermentation activities. Cella already fermented her urine prior to the study, fertilising her tomato tree on the balcony. Supporting the researcher and pure curiosity for how the study would be received, were her entry points. Such shared interests brought about mutual obligations. While Cella was not involved with the technical preparations, she acted as scientific advisor during workshop presentations. Through the technically failing project, the work-oriented relationship between the researcher and Cella has strengthened due to transparency that promoted the constructive rapport.

The next adventure rendering (figure 61) is from a person who was not closely affiliated with the researcher prior to the study, yet nonetheless able to establish a sense of deeper connectedness in the course of the study.

(figure 61) **Adventure rendering 3: Uncertainty unlocks portal of self-exploration**



The existentialist homemaker: In this journey the collaboration was from start to finish about self-reflection and self-caring in relation to otherness. The arc of discovery originates from a sense of personal receptivity (green overlap) and spans gradually into the relationally-autonomous dynamic where both uncertainty and conncectedness made created a sphere of creative sharing and personal expansion.

A (3) · **Adjustment from safe space of shared imperfection.** For Vincent (37), the study has resonated with his recent substance abuse rehab: witnessing the serial plant starvation made him reflect on what constitutes interexistent thriving. As mid-aged musician transitioning toward a health-conscious life, fermentation presented a form of contemporised folk wisdom. When achieving the original goal of growing plants failed, Vincent found value in journal keeping – what he called a "reflective springboard" [exit interview, Vincent] – for uncovering how daily life is intertwined with the wider world. What started out from an interest in moderating eating intake or exploring fermentation as means of bodily detoxing, became an inward, reflective journey of self-acceptance in relation to otherness. When the facilitators' imperfectness became obvious (from day one), Vincent could allow to access his vulnerability too. As self-declared introvert the one-on-one conversations with the researcher asserted how facing adversity together can be the basis of aliveness and belonging.

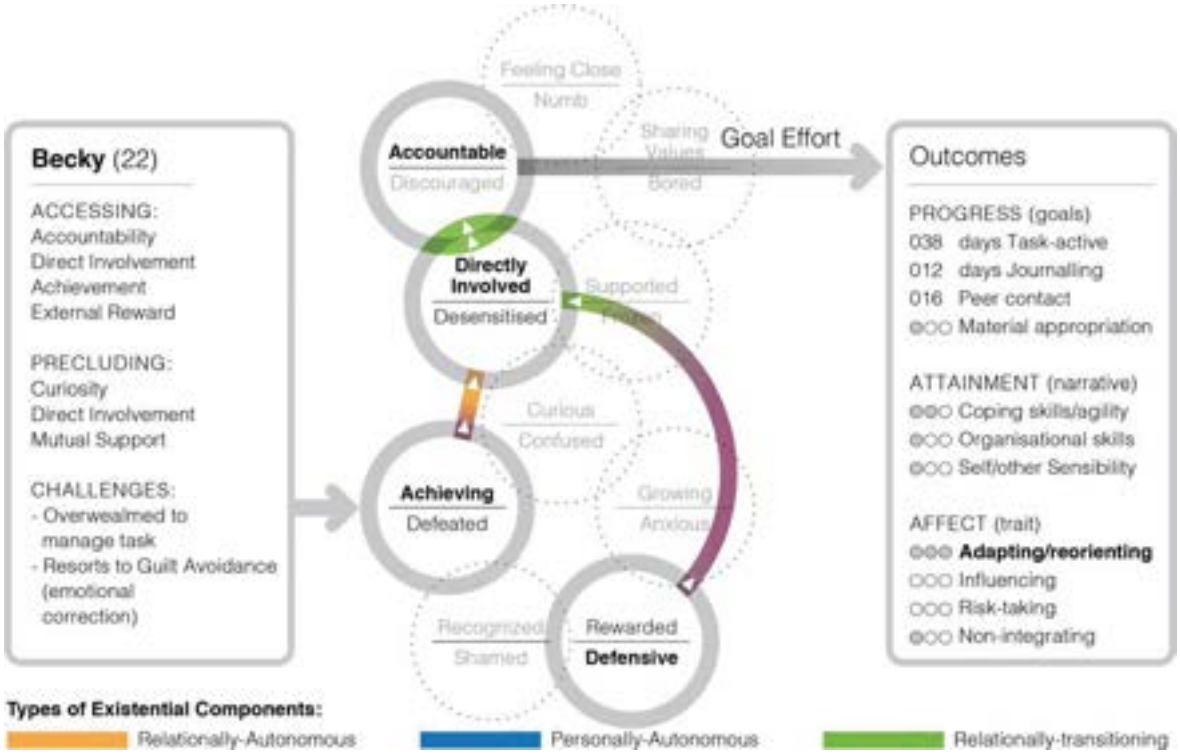
The mutual and unequivocal acceptance of personal imperfection, together with the affective atmosphere in the group opened up a safe sphere for generative vulnerability with intimate moments of exchange.

B (3) · **Growth from approaching failure as anchor of reflection:** For Vincent the uncertainty shifted his engagement from partaker to conscious thinker and conversation partner. Vis-à-vis procedure breakdown, understanding the underlying, ethical implications were more important than fixation on horticultural problem solving. Feeling rewarded came simply from the cognitive input and appreciation of being a temporary member of a *sui generis* experimentation endorsing efforts of self-improvement.

C (3) · **Rendering of holding brave conversations:** Introduced through a mutual friend, Vincent and the researcher shared an affinity for spontaneity embedded in daily life, helping nurture a sense of collegiality throughout the collaboration. It was mostly during confessional conversations with the researcher where Vincent fully engaged. In such relational dynamics, perspectives can be fast-changing, fragile and momentary which makes them quirky, dynamic and alive. Affinity and closeness make therefore *adventure renderings* subjective and not impartial. So rather than pretending to be statements of behaviour, they are an interim work document for sensing the human pulse in a collaborative connection. Adventure renderings may not only reflect existential dynamics but also aggregate personal inclinations that require privacy.

Another personally delicate *adventure rendering* (figure 62) depicts the existential journey of a college student who was referred to the study through her former ecology professor.

(figure 62) **Adventure rendering 4: Reputation rescue from integrative competition**



The student homemaker: In this journey the collaborator is first being overwhelmed juggling project demands next to school exams, thus seems to lose touch with self and others early on. With 'Achieving' as the driving entry component (left arrow), a focus mostly on tangible outcome, did not provide enough reinforcement to withstand aversity. After a fortnightly hiatus, Becky made a last minute comeback after witnessing peers' advancements with certain remorse. Being 'Directly Involved' in peer presentations, re-sensitised her accountability (green) and made her want to earn her completion certificate (be 'Rewarded'). The bowline with green-purple gradient indicates how harder-working peers trigger Becky's competitive nerve and guilt avoidance. In this journey, extrinsic motivations (benefits and rivalry) endorse reintegrating, intrinsic behaviour.

A (4) · **Adjustment from guilt avoidance vis-à-vis examplatory peers:** Early on, Becky (22) had ceased the daily nurture tasks at home, minimising her engagement to uninvolved workshop attendance due to lack of results and school exams. Yet, when her peers presented their relentless, inventive efforts at the final workshop, the display perseverance, helped Becky realise there was leverage in her own actions. The regulative rivalry triggered her restart a number of planting experiments which she documented thoroughly—eventually, to make her worthy of the attendance certificate. Having the ability to fall back on peers and facilitators allowed her to stay connected and adjust her behaviour, rather than feeling bad about herself and surrender. Maintaining close relation was pivotal to keep her self-determination dynamic intact.

In this *adventure rendering,* the extrinsic needs toward tangible achievement (including extrinsic rewards), propelled the more intrinsic and longer-term pursuit of re-engaging and advancing the project. The regulating existential dynamic here hinged on *direct involvement*

with the group that transformed a latent sense of discouragement into a sense of *accountability* thereby provoking nurture (*green* overlap).

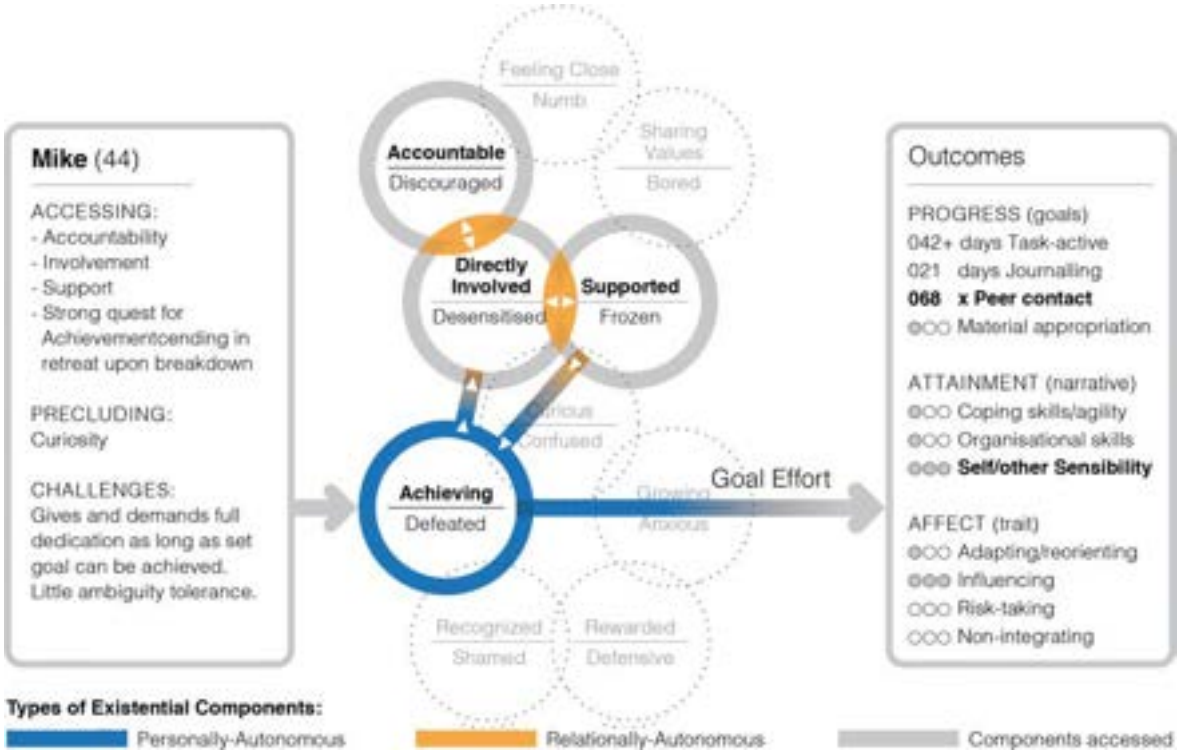
> Regular informal status checks with facilitators, unequivocal exposure to peers with complimentary expertise, and the mandate of a larger-than-self mission, were all likely part of the relationally-transitioning momentum here.

B (4) · **Growth by linking task negligence to reconstitution of self-worth:** The adversity contributed to frustration that made Becky rapidly surrender. In the last workshop when peers presented the fruits and stories of their horti-technic improvement attempts, Becky realised how she was comparatively underperforming. She was not able to contribute to what was supposed to be an agroecological research. Knowing that her performance influenced the facilitator's welfare, and being in direct exchange with peers, put her in the position to reconsider her contribution from an outsider's perspective. Becky has re-engaged both to show allegiance to peers, and saving face to avert humiliation.

C (4) · **Rendering of a student-mentor relationship:** Becky inhabited the role of a pupil in the study. The researcher consciously reached out to Becky, offering extra guidance in interactions akin to mentorship. With personal knowledge gained from the intake interview, the researcher was aware of Becky's previous failed plant-growing attempts which became a reference of the conversations and horticultural coaching. The underlying theme in this dyad of personal endorsement was averting another planting mishap.

The first four renderings illustrated the existential journeys of more relationally-autonomous inclined participants. In contrast, the next *adventure rendering* (figure 63) derives from a decidedly more self-determined participation mode.

(figure 63) **Adventure rendering 5: Prosocial involvement powered by self-determination**



The foodpreneurial homemaker: In this journey the collaborator engages more instrumentally with the group. Here, strong transpersonal involvement was serving mainly self-determined interests. Achievement-orientation in seeking the solution (for renewable fertiliser in water-based planting) drove a highly committed and linear involvement (blue-grey gradient) which was primarily self-interested: when the common goal became elusive and unattainable, the engagement ceased.

A (5) · **Adjustment is bound to self-defined interests:** Running his self-built hydroponics system on the rooftop, Mike's (44) motivation was clearly delineated: finding the magic organic formula for regeneratively growing plants in water. Spurred by the promise for direct, personal benefit, Mike went out his way and even recommended the study to his neighbours, long before it kicked off. Mike flourished in this 42-day long 'home hackathon', because 21 peers concurrently worked toward one goal. There was urgency in the floundering plants, and there was shared attention from peers. When the odds of finding the fertiliser formula were intact, Mike was spearheading trouble shooting and knowledge exchanges. When own efforts were futile, he reached out in earnest, hoping others had a breakthrough. When failure was inevitable, Mike retreated to the background. When attention shifted from hydroponic to hybrid options, he disengaged. Adversity initially intensified his involvement until the initial purpose had ceased. The pursuit of relationship goals (*accountable*/*discouraged*) shifted from one polarity to the other.

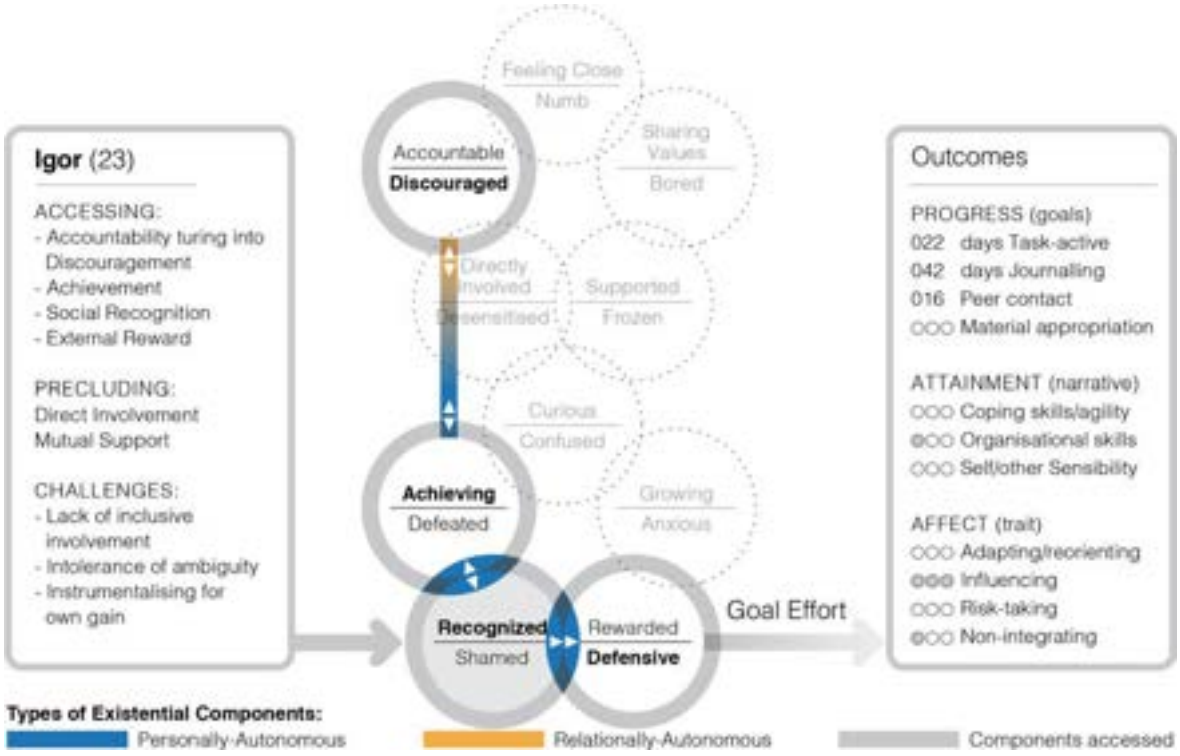
The unequivocal engagement and the affective atmosphere in the group that drew on peers with complimentary expertise, was amalgamating for the pursuit of his single-purpose, personal mission, which prevented him also from integrating the interest of others.

B (5) · **Growth in affirming trait of perseverance:** Adversity did not detract Mike from staying focused on agential goals. The obstacles made him intensify his efforts until they no longer seemed justified. In this sense there was little ambiguity tolerance. When the breakdown marked the end of the original goal, Mike set out to another self-defined pursuit. In wake of discussion on toxin exposure, Mike launched into concocting his own deodourant. Mike partook in the group to a large degree as form of self-investment, yet, he contributed to group spirit with humour and positivity as well.

C (5) · **Rendering of yield-driven cooperation:** Mike and the researcher met through a mutually attended course where the study was discussed. This resulted in a working cooperation that ceased on the last day of the study. Mike thrived in the work alliance with 21 peers in his role as instigator of problem solving. With his family not engaged in his hydroponic operation, the study members were conspirators. Even though the group served just a single-use purpose, the is inherent value in engaging highly rational individuals temporarily in transpersonal commitments.

The next *adventure rendering* (figure 64) traces the dynamic of another highly self-determined collaborator dispositioned to satisfy more extrinsic needs.

(figure 64) **Adventure rendering 6: Failure undermines aspiration for extrinsic benefits**



The strategic homemaker: In this journey the venture appeared to be foremost an instrument to assert personal, external needs at home. Igor hoped the venture would lead to a scientific breakthrough and was meant to stipulate his respective career ambition toward his mother. The desire for recognition and benefits initially mobilised a sense of achievement and accountability which was early on disappointed. Due to low relational involvement the efforts faded as soon as the system fell technically apart.

A (6) · **Adjustment restraint in instrumental perspective:** Igor (23) had hoped the study could help advance his career aspirations in biotech research. In his view, the lack of outcome, sabotaged the citizen science prospect, and diminished recognition opportunities on Instagram. In the least, colonising the home with the contraptions apparently has assisted in exerting influence power relations in the family. While he enjoyed the information delivered without guarantees of success, he would not to enter the shared struggle.

The rendering on the composite aggregate shows how the *accountability/discouragment* polarity (*blue-orange* gradient) is disconnected from the two other core polarities in the centre of the adventure rendering—*closeness to others* and *direct involvement.* In this constellation, *accountability* that is loosely linked with *achievement,* was not sufficiently endorsing for a prolonged effort in adverse situation, thereby ensued a gradual drift into *discouragement*.

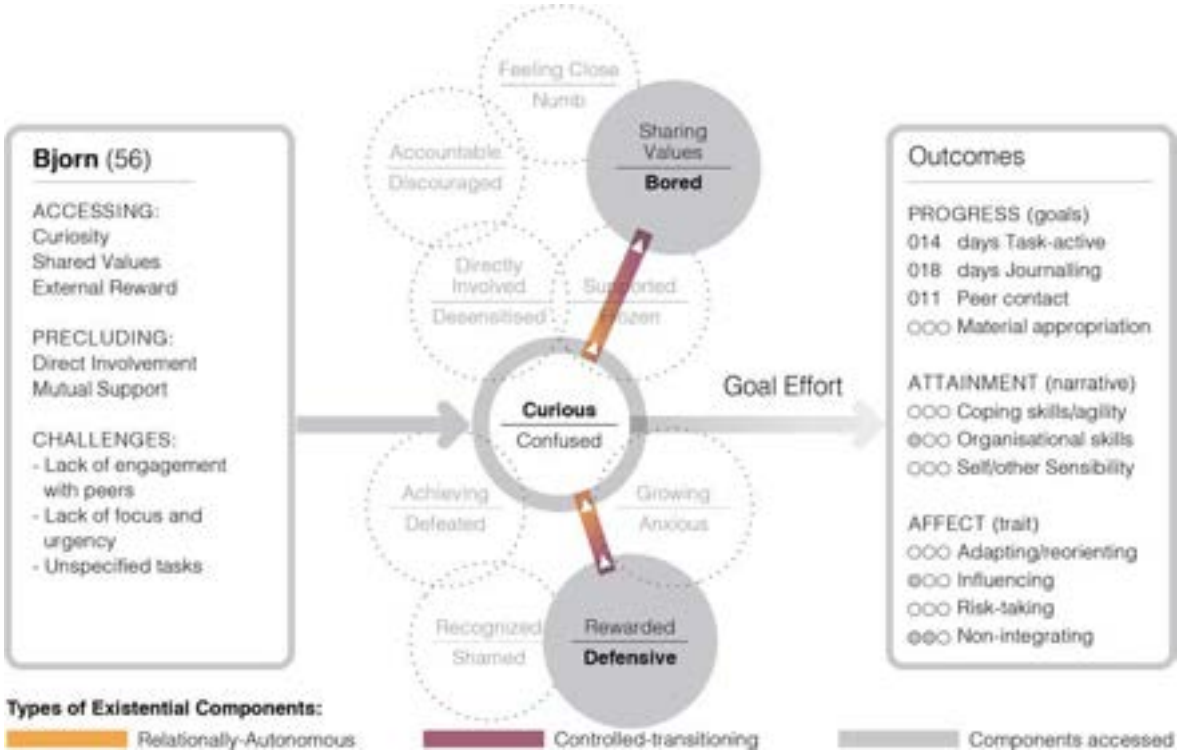
In the headstrong frame of mind that seeks safe bets, the mounting obstacles both from the demands of technical failure and necessity for involvement, investing must have been rather daunting.

B (6) · **Growth in exposure to experiential difference?** For this aspirational young adult, the failing study has disappointed Igor's predetermined agential. Creating a potential human-plant connection was likely seen as means of exerting power than adding to self-improvement or a shared narrative. Igor remarked how the diversity in the group has been discomforting and overwhelming. In the kind of unsupported condition in which Igor found himself, disequilibrium triggered a personal retreat based on feeling inferior and dissociated. In spite of this dissociation, there were spurts of connection with the group during touch-down rounds, and presentations in the plenum that may have nudged on Igor's operational logic.

C (6) · **Rendering of suspended service journey:** Igor had attended the bokashi workshop of the researcher the year before. Fixated on the idea of a citizen science project, Igor was not in the mindset to transcend his existential position when the system failed him. Possibly clarification about mutual expectations early on with facilitators could have assisted to unbound the purpose of the engagement. Feeling obligated to support the facilitator's research was decisive for Igor in enduring the technically inferior venture. Accountability here did not translate into substantial dedication because the extrinsic success rational was too remote from what the project could deliver.

Aside from extrinsic expectations, other participants brought inveterate, existential response strategies into the study. The next *adventure rendering* (figure 65) displays a dynamic of a somewhat more distressing experience.

(figure 65) **Adventure rendering 7: Reliance on anecdote and alibi**



The unsettled homemaker: This journey indicates how intrigue and ideals alone are not sufficient to remain engaged in precarity. The desire to learn a new way of growing plants was not substantiated with enough self-determination and relational autonomy. Remaining in the project was about waiting for something better to arrive (transitioning from 'Sharing Values' to being 'Bored') while trying to stay connected with the group when technical failure was inevitable through defensive tactics with apologies and alibis (transitioning from being 'Rewarded' to becoming 'Defensive').

A (7) · **Adjustment hampered in self-defence:** Unable to juggle the study's demands with work-related obligations, Bjorn's (53) active efforts ended already in the second week and after the first batch of seeds had dried up—for lack of watering. Bjorn was hoping to find recognition from his fermentation workgroup back home. This was disappointed when the study underperformed. This participation was made dependent on many externalised factors and thereby more prone to be self-defeating. What made Bjorn's existential passage distinct was a demonstratively apologetic, almost self-humiliating reaction to being overwhelmed. Unlike other participants, he repeatedly delivered lengthy reports in front of the group, on the myriad reasons that prevented him from taking action—while publicly lamenting his inadequacy. When others quietly disengaged, Bjorn readily shamed himself likely in an attempt for reconnecting with the group.

The researcher, too preoccupied running the study, did not notice the self-defeating tendencies, until transcribing the exchanges. Using the *adventure rendering* early on, could have indicated the maladaptation. The study was a deliberately open social arena that respected participants right to engage which in whatever way they preferred. Fully aware of

their lack of clinical qualifications, facilitators could have made room early on for mutually evaluating potential alternate coping approaches. Particularly in sight of more longer-term collaborations such friendly feedback on the sidelines of the action could assist in controlled dispositions to better integrate with the group process. Fortunately the group atmosphere was forgiving and concentrated on the common task.

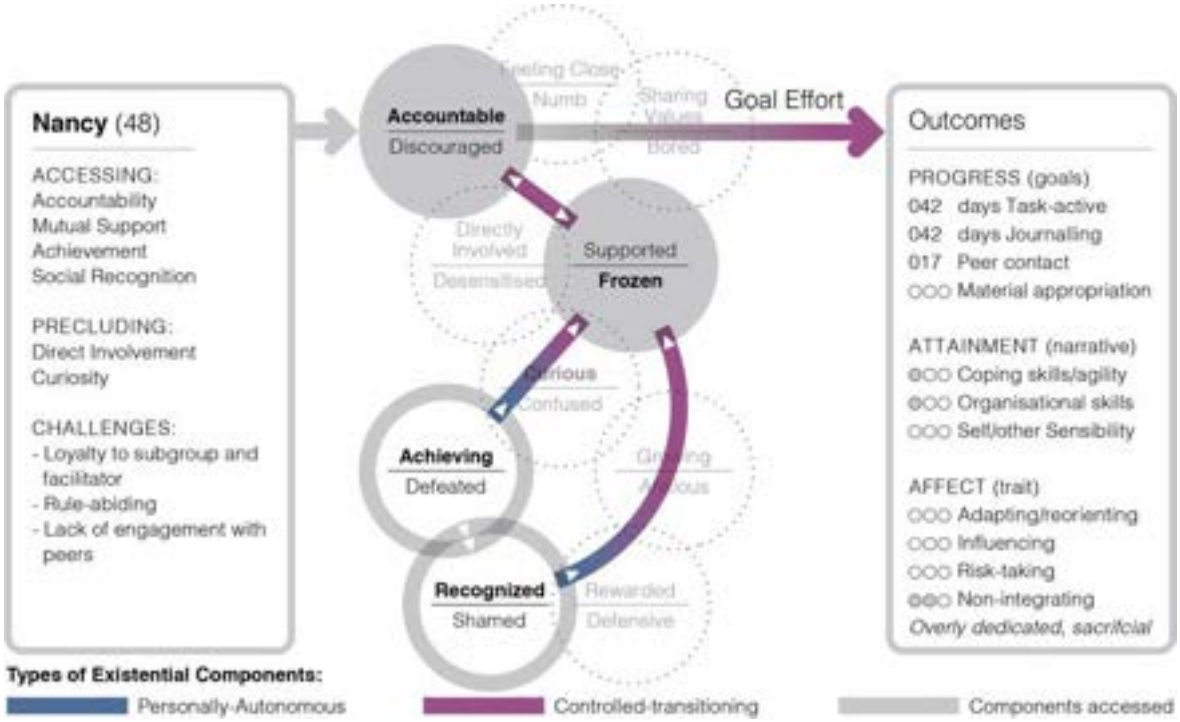
Analysing Bjorn's statements closely gives indication of how the group was used as a sounding board for personal frustrations. Rather than just sympathetically listening to his contrived distress, cordial feedback could have helped him better integrate and transform his experience.

B (7) · **Growth in self-exposure?** The study's adversity did not only overwhelm Bjorn (like so many others) but left him exposed since he regimented himself to self-perceived disadvantages and emotional self-defence instead of investing volition into creative adaptation with the longer view in mind.

C (7) · **Rendering of a six-week, 'remote maker faire':** Bjorn learnt about the study from the website of a hydroponic system provider. This could have given the false promise for engaging in the study with a 'turnkey' solution. This *adventure rendering* expresses how *curiosity* easily turns into its polarity of *confusion* when remains unsubstantiated without the lifeline to the group in *direct involvement* and *mutual support.* Bjorns *curiosity was* sparked by novelty and notoriety which translate into *reward* and *value* in the rendering which are unreliable predictors in joint coping (Gore et al, 2018).

The last *adventure rendering* (figure 66) shows an experiential journey where an excessive sense of other-obligation (externalised authority) has hampered adequate adjustment and led to a rather depriving experiential journey.

(figure 66) **Adventure 8: Compulsive accountability**



The devotional homemaker: This journey is framed by a strong sense of accountability bordering on self-sacrifice. Fuelled by a desire to achieve tangible outcome and being recognised as diligent student, the success rationale was tied to others: Nancy found herself accountable on three levels, toward her previous teacher Oscar who introduced her to the venture, the subgroup of Oscar's alumni, and the facilitator. With so much external authority, the imposition of making the impossible work pushed personal needs like enjoyment and self-realisation aside, making the experience sacrificial.

A (8) · **Adjustment hampered in obligation to others' success:** Nancy (48) approached the study like a 'crash course for hydroponics' 101'. Hoping to learn the ropes, Nancy delivered the most exemplary task execution, diligently obeying the given rules, and spending daily two hours on plant care. Apparently she held herself accountable to her former professor (introducing her to the study), the subgroup she belonged to, and the researcher as well. When the urine tubes exploded, Nancy batch-purchased industrial fermentation airlocks to equip the entire subgroup in a caring emergency response for controlling the gas release. While most other moderated their efforts, Nancy ramped them up to make the given system work at all cost.

While Nancy was digitally interacting with her closed subgroup that could provide emotional support, yet there was less interpersonal and critical reflection compared to the main group, on how to put time to better use, or consider alternative options.

B (8) · **Growth in learning from state of exception?** Constraint in obligations to others toward others, adversity made the study burdensome, preventing Nancy from enjoying and learning from the emergent developments. The closed subgroup engendered among its five members a sense of closeness, yet it also was an obstacle for upholding her self-coherent needs for mental autonomy and competence. The linear *adventure rendering* shows a deficit in negotiating this inner and outer authority important to preserve personal boundaries and prevent frustration.

C (8) · **Rendering of distant facilitator-student relationship:** Nancy came to the study through her former ecology professor and his subgroup of alumni to which she was strongly committed. In addition to the language barrier, it reduced direct interaction with the researcher to the interviews at the start and end point of the study. In this rather distant teacher-student relationship, the researcher was not aware of Nancy's isolating diligence until the study's end. Due to lack of personal rapport, the facilitator was unaware of Nancy's distressing journey and potentially counteract. Possibly, if facilitators had clarified mutual expectations early on and addressed them, it could have helped Nancy to evaluate her efforts and coordinate them in relation to the group.

This concludes the *adventure renderings* which were intentionally chosen to exemplify the four patterns of existential passages outlined above (see 6.3.2). It should be remembered that the renderings provide highly contrasting journeys, so that the features of collaborative dynamics become more discernible. To consolidate the findings, the psychodynamic insights need to be correlated to implications of mental flourishing.

6.4.2 · Three assumptions

By comparing the eight *adventure renderings*, variances in ways of engaging with adversity can be revealed. Given attention and awareness to the process, participants adapt and possibly enjoy disequilibrium in collaborative settings. The renderings are an effort to visualise this awareness-making of the direct experience in an effort to give direction and open creative potential "to what otherwise is blind" (Dewey, 1997:69) inside the ambiguity that explorative collaboration is. *Adventure renderings* are about uncovering the strengths and weaknesses of collaborative facilitation for unleashing in collaborators their unique potential of flourishing. The focus is on expanding sociopsychological consciousness that

helps people not just to adapt to ambiguity but to flourish. *Adventure renderings* are meant as integrative means of observation and conversation toward this intention.

For better overview and cross-comparison, the existential polarities represented in the *adventure renderings* above have been summarised in the listing below (table 14). Each participant's existential aggregated journey is put in relation to their adjustment to adversity and personality constructs.

(table 14) **Adventure renderings and flourishing tendencies under disequilibrium**

EXISTENTIAL COMPONENTS	AGGREGATE	ADJUSTMENT FACTORS	PERSONALITY CONSTRUCT
JYLL (43) [ ] Transpersonal: + Direct Involvement (P) + Mutual Support = Accountability Self-determined: + Personal Growth + Curiosity		○ Thriving via 'deliberate group process' **for bonding** ○ Adjusting with 'relatable others' **makes it enjoyable** ○ Growing in 'affective group atmosphere' to find **self-affirmation**	• Personal trait **characterised** by relationships in group • Personal goals **integrate** mutually beneficial goals • Personal narrative **informed** by shared narrative ○ Contributes to peers with diverse expertise (learning as communal organiser) ○ Finds purpose in one-of-a-kind change initiative
CELLA (28) [ ] Transpersonal: + Direct Involvement (P) = Accountability + Mutual Support Self-determined: + Curiosity + Achievement Controlled: + **Accountability** *= Discomfort Discharge*		○ Thriving via 'deliberate group process' for **expanding success rational** ○ Adjusting with relatable others for **cultivating modesty** (from "Beta to Alpha tester") ○ Growing in affective group atmosphere to attain **self-regulation**	• Personal goals **gradually integrate** mutually beneficial goals • Personal narrative **informed** by shared narrative ○ Endorse peers in their own process (learning as educator) ○ Find meaning in shared discovery
VINCENT (37) [ ] Transpersonal: + Shared Values = Direct Involvement (F) + Closeness to Others Self-determined: + Curiosity + Personal Growth		○ Thriving via 'reflexive group process' for **unlocking self-exploration in ambiguity** ○ Adjusting with relatable others to **access resolve in shared uncontrollability** ○ Growing in affective group atmosphere from **multiform conversational reflection**	• Personal trait **primed** by relationships in group • Personal narrative **integrates** shared narrative ○ Locates social consciousness from peers (learning as mortal citizen) ○ Finds meaning in criticality-inducing initiative
BECKY (22) [ ] Transpersonal: + Accountability + Direct Involvement + Mutual Support Self-determined: + Achievement + Curiosity Controlled: *+ Guilt Avoidance*		○ Thriving via 'reflective group process' for **reintegrative reputation rescue** ○ Adjusting with relatable others by **linking own negligence with self-worth** ○ Growing in affective group atmosphere via **personalised attention** (status check)	• Personal goals **gradually integrate** mutually beneficial goals • Personal narrative **informed** by shared narrative ○ Is compelled by grit from peers (learning as aspirant) ○ Finds purpose in larger-than-self, achievable goal
MIKE (44) [ ] Transpersonal: + Direct Iinvolvement = Accountability Self-determined: + Achievement + Curiosity		○ Thriving via 'productive group process' for **predetermined goals** ○ Adjusting with relatable others **under condition of swift results** ○ Growing in affective group atmosphere by **exploring agency**	• Personal goal **conditionally integrates** mutually beneficial goals ○ Gains access to peers with diverse expertise (learning as co-worker)

I G O R (23) [ ] Transpersonal: + Accountability + Mutual Support = Direct Involvement Self-determined: + Curiosity + Achievement *+ Reward (x)* *+ Recognition (x)*		○ Thriving via 'productive group process' for **predetermined ambitions** ○ Adjusting with relatable others **under condition of swift benefits** ○ Growing in affective group atmosphere by **channelling agency**	• Personal narrative **conditionally informed** by shared narrative ○ Seeks access to initiative as imaginative springboard Potential counter-measure: Early revalidation of mutual expectations early in one-on-one status check with facilitator
B J O R N (56) [ ] Transpersonal: + Indirect involvement (F/P) = Closeness to others + Support Self-determined: + Achievement *+ Recognition (x)* Controlled: *+ Self-shaming*		○ Thriving via 'restorative group process' for **personal stress management** ○ Adjusting with relatable others **under condition of personal approval** ○ Growing in affective group via **persuasion in eloquence**	• Personal trait **conditionally characterised** by relationships in group ○ Seeks access to peer group as sounding board for frustration and alibi (self-defence) Counter-measure: Diversion of self-defence tendencies into safe zone of one-on-one exchange with facilitator
N A N C Y (48) [ ] Transpersonal: + Closeness to Others + Accountability = Support Self-determined: + Achievement Controlled: *+ Self-surrender*		○ Thriving via 'restorative group process' for **transpersonal rehabilitation** ○ Adjusting with relatable others **under obligation** (dutifulness) ○ Growing in affective group by **persuasion in diligence** (demonstrate endurance)	• Personal trait **conditionally characterised** by relationships in group ○ Seeks connection in approval from peers and facilitators Potential counter-measure: Early revalidation of mutual expectations in one-on-one status check with facilitator
[ ] relationally-autonomous [ ] personally-autonomous [ ] relationally-transitioning [ ] controlled-nonautonomous (P) peers (F) facilitator (x) external goal			

The table above contrasts the eight adventure renderings by setting the existential aggregate of the *adventure renderings* (columns one and two) in context with the factors that helped participants to adjust to disequilibrium (column three) and indicates how selfhood was likely constructed in relation to group and project (column four). Each of the four patterns of existential journeys (see 6.3.2 above), is represented by two examples, from top to bottom: relationally-autonomous [ ], personally-autonomous [ ], relationally-transitioning [ ], and, controlled-nonautonomous [ ] mental flourishing journeys.

This table above renders existential aspects from participants who withstood and make sense of an experiment that was demanding, chaotic and uncertain. In the comparative analysis of the adventure renderings, three main assumptions can be formulated based on the influences that made adjusting to failure in some ways rewarding or even enjoyable. The three assumptions for core factors in failure-friendly, joint processes are: (1) bundling qualities in existential motily, (2) ambiguity of care and closeness, and (3) multipurpose group rationale (me-to-We).

Assumption (1) · **Bundling qualities in existential motility:** Comparing the interconnective arrangement of existential polarities across the aggregate types, reveals how among the relationally-autonomous [ ], and personally-autonomous [ ] renderings are both vertically

oriented and bundling (concordant) motility patterns in the passages of accessed existential components.

Vertically oriented motility refers to how all four relationally-autonomous participants in upper top half of the table (Jyll, Cella, Vincent, Becky) enter the project with one or two existential polarities (very left in aggregate) and are transitioning into other polarities in the course of the study (very right in aggregate). Typically, these participants would enter the project with more self-determined inclinations like *achievement*, *curiosity* or *personal growth* and gradually migrate toward more transpersonal inclinations like *mutual support* (Cella), *accountability* (Becky) or *shared values* (Vincent). Vertical motility is embedding self-determined into transpersonal polarities.

Bundling motility refers to the interconnectedness among the existential polarities traversed, where one existential inclination can activate others nearby in the aggregate. An illustrative example for this *bundling, concordant motility* is Vincent [ ], whose outward desire for *personal growth* (reorientating lifestyle) is bolstering his *curiosity* (concerning planting ethics), which in turn stimulates *direct involvement* (eliciting information) that then triggers accountability (reporting reflections), which in turn leads to a certain *closeness* with the researcher (to establish trust in confessional exchanges) and eventually manifests in *shared values* (to accept mortality as intrinsic part of life). Bundling motility mobilises outer into the baseline polarities, providing synergies for expanding learning.

Linear motility in contrast, are movements predominant in the existential journeys of participants listed in the lower half of the table (Mike, Igor, Bjorn, Nancy) which are more *consequtive*, *horizontally oriented* and *discordant* (unbundled). In the sample of Igor [ ], the existential aggregate gravitates around the gratification of benefits throughout the project – *social recognition* and *external rewards*. *Accountability*, the consideration for the fate of people organising this study is only loosely linked with these self-vested, more extrinsic interests. Compared to the passages on the upper half of the table, here none or just one of the core existential components (*curiosity*, *direct involvement* and *mutual support*) is being accessed.

In practical terms it means that the commitment in these lesser *bundled*, more *linear* passages did not necessarily produce weaker dedication, but ended more abruptly. Presumably upon the technical breakdown, such *adventure renderings* indicate reduced enjoyment in adversity since there was less redundancy in existential polarities. Here the repertoire of alternate existential potential that is available in oneself and others was likely to be more limited.

Assumption (2) · Ambiguity of care and closeness: The *adventure renderings* indicate that two existential components *accountability* and *closeness to others* deserve closer attention. Offhand, it could be expected that care – the derivative response from feeling *accountable* – and *closeness to others* would be constantly reliable existential predictors for relationally-autonomous collaborations. Yet, a closer look at the adventure renderings reveals that *accountability* and *closeness to others* are likely ambiguous predictors for failure tolerance and expanded learning.

In the case of Cella, for example, the well-meant caring sentiment for her peers became a means to impose her critical judgement (flimsy scientific preparations) temporarily onto the researcher. The resulting blame quickly resolved when she realised how peers had well-adjusted to the challenges, thereby caring less could open room for unplanned developments. In the sample of Becky where the plant care fell victim of other priorities, witnessing a sense of *accountability in others* likely has trigger her own and made her *more* caring, at least temporarily. In both examples, participants had a moment where they regained clarity (awareness) and realised what their position in relation to the success of the project was, thus validating more adequate responses in line with such revised success rationale.

For Nancy, the *closeness* to her former teacher and subgroup led to *accountability* that increasingly was self-confining. Such imposed, unreflected caring in the face of obligation to others led to frantically follow misconceived impositions (inferior system, outdated rules) while suspending one's own critical thinking or self-affirming intuition leading to the detriment of personal needs. The ambiguity of accountability that may strengthen relational commitments between people while weaken individual criticality is well documented in motivation research (Gore & Cross, 2006:137).

Assumption (3) · **Multipurpose group rationale (me-to-We):** Group rationale is the purpose the participants ascribe to the justification of the group. Everybody wants to flourish on their own terms. The multitide of adaptive strategies all collaborators employed, give testimony to this basic need. Most exemplary here is how participants harnessed group engagement in relation to personal predisposition and needs in a situation of ambiguity. The adventure renderings show how participants found in the study four distinct rationales depending on their disposition. In direct correlation with the four existential passage patterns (6.2.3), participants engaged either in contributive (deliberately generous), reflexive (contemplative), productive (utilitarian) or restorative (destitute) ways with the group.

Contributive rationale: Participants realising more *relationally-autonomous* passages (Jyll, Cella) [ ], were partaking from a position of generosity and proactive contribution in the group processes. The engagement here was both about the deepening of relations (Jyll) and expanding of interpersonal horizons or potentials (Cella). Adjusting with relatable others in this 'contributive' outlook, meant to remain in mutually endorsing relations with each other, which cultivates selfhood from a position of regulation and enjoyment. The affective group atmosphere influenced the person's growth likely through simultaneous self-affirmation and coregulation.

Reflexive rationale: For participants with less transpersonal dispositions, the group process had more reflexive momentum as seen among the relationally-transitioning individuals (Vincent, Becky) [ ]. Here other the proactive contribution of other group members could unlock a need to reassure one's position when others spearheaded the advancement of the task. This reflexivity in acting through activated others, could lead to a more critical sense of selfhood. Personal growth in affective group setting here likely derived from informal conversational reflection as well as formal and premediated interventions from others when the situation required adjustment.

Productivity rationale: The more ambitious and self-determined collaborators were able to harness the instrumental potential of the group process (Mike, Igor) [ ]. In this group utilisation dynamic, participants saw in the opportunity to advance foremost their own interests. Productivity-oriented collaborators were likely to be as demanding to the group as to themselves and invested advance research or extracurricular efforts demonstrated agility

in group interactions. With this rigid focus, commitment was likely to fade quickly when the original goals came under threat. Productivity-inclined collaborators can be highly effective in asserting influence on the process which potentially diminished room for engaging personally with spontaneity or otherness.

Restorative rationale: Certain participants were presumably not in the position to *contribute*, *employ*, or *reflect upon* the group process. Few participants seemed to rehabilitate themselves in the collaborative situation. Participants who were on *controlled-nonautonomous* journeys (Bjorn, Nancy) [ ], the group process took on a restorative function. In this rationale, participants' internal concerns unrelated to the study were brought into the group that was implicated in their distress management. This complicated the engagement because it came under personal preconditions of eliciting group approval, finding reward, or addressing unmet needs for connection.

The ***adventurous renderings*** introduced in this analysis are still at the exploratory stage and can claim neither accuracy, nor statistical validity, nor full workability. What *adventurous renderings* can do is to visually endorse mental flourishing dynamics in collaborative settings. By offering illustrative expressions of existential polarities and passages in relation to the situation, they offer a *conversational tool* for directing attention the contingencies between person and group. Such integrative, conversational renderings can be the starting point to evaluate the joint creative processes and facilitate improvements of their collaborativeness.

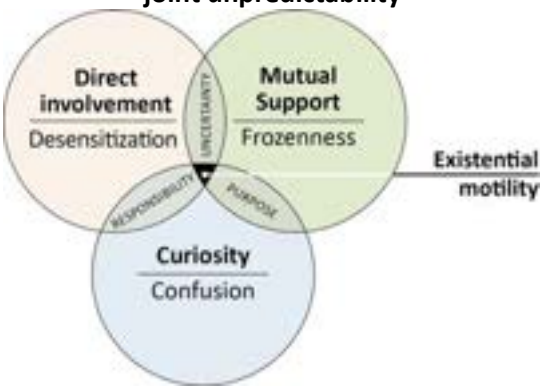
6.4.3 · Existential motility is render-able

Through the iterative process of reflecting-by-marking, this analysis has arrived at the *adventurous rendering*. A visual and episode-oriented evaluation tool for approaching participants' existential motility of persons engaged in collaborative settings. In appropriating statements (measures) from motivation research onto joint creative processes, an open-frame, aggregate model of experiential polarities has been established for correlating existential predispositions and outcomes in collaborative relationships with the actual engagement of the person. Adventure renderings invite the participants and

facilitators to trace their collaborative journey *together* to bring consciousness and foresight adaptation dynamics in group and situation.

While the adventure renderings derived after completion of the study and the measures served interpretatively rather than statistically, the analysis indicated how the three existential polarities of *curiosity/confusion*, *direct involvement/desensitisation*, and *mutual support/frozenness* – in close combination and equal importance – were the primary factors in withstanding (and even enjoying) the failure-prone collaborative situation. The inverted pyramid shown in the next Venn diagram (figure 67) is the aggregate of these three existential polarities and is the core dynamic in *adventure renderings* that engendered in participants deeper commitment and enjoyment.

(figure 67) **Core existential polarities engendering commitment and enjoyment in joint unpredictability**



The sociopsychological analysis revealed how adversity can be an enriching experience when encountered in a collaborative setting that affords direct involvement (access to control), mutual support (unconditional backing), and curiosity (captivating concern).

Participants who flourished best in the chaotic and inefficient collaborative study (two thirds of the adventure renderings) all resourced at least two out of the three core existential polarities. All of them accessed the *curiosity* component (as the personally-autonomous aspect) and in addition either *direct involvement* or *mutual support* (both relationally-autonomous aspects). The more a participant was able to integrate these components, the more likely the person was to actively contribute and enjoy the adaptation to uncertainty. The implications of these three components in relation to this collaborative study are summarised here.

***Curiosity*—compelling self-discovery in sense-finding:** The collaborative study failed technically but it expanded capabilities among most participants by cultivating relationality from confrontationally engaging with obstacles and unlikely partners. The interval of action-and-reflection brought about constant movement between the familiar and unfamiliar. It was expressed through working in group and in solitude, reporting in open conversation and in closed journal, engaging with peers and with family. Curiosity in this study was about making this perceptive porosity socially alluring and personally understood: people could find explorative niches for reaching outside their selves into the unknown and attain a certain clarity from confronting the habitual with the particular (Gilsdorf, 1998:134). This is revealed by the experiential passages that express the eagerness to learn or advance in uncertainty made enticing in social cohesion (6.2.4). The individually adaptive timeframe allowed participants to reflect at the workshops and at their own pace (in the privacy of the toilet for example) since only pausing can make room for reflection.

***Direct involvement*—mobilising self-contracting:** While curiosity is the ignitor of engagement, direct involvement is the stipulation thereof. Direct involvement entailed not just interactions but transparency on limits, motivations and potentials underlying such interactions. Due to facilitators' apparent ill-preparedness, the rules and agreements were up for grasp and pushed open for negotiation with all participants. The technical failures as a 'deal breaker' were a blessing in disguise since participants had to claim internal control for resetting ambitions, responses and communication. Contrary to care or closeness, *direct involvement* was imperative to keep in check the relational vagaries of exerting too much trust (in the facilitator abilities) or too much loyalty (to the professor recommending this study). Since affinity was less reliable than critical reflection in this 'self-contracted' study, the group echanges fulfilled different purposes depending on the participants mental autonomy.

Mutual support—failure-stabilising knowledge wellspring: In the heat of the unresolved situation participants employ direct involvement for establishing self-support that derives from an ecology of mutual support. Herbert Stevenson's vulnerability-internalisation juncture that was adapted in this study into the *integrative autonomy* chord (6.3.1) illustrates how counter-balancing frustration with support is most essential in collaborative settings. Supportive ecologies depend on the opportunities for (re)connecting. Mental

flourishing and adjustment (6.3.2) were likely enabled in interstitial encounters of conversing, conspiring, confabulating or confiding. The facilitators and the researcher subjected themselves continuously to the same procedures as all participants in order to remain sensitised to their experiences. This sensibility together with accepting imperfection, made facilitators to fellow strugglers. The resulting task-centred dialogues were elemental to reintegrate disappointments or questions of the moment with practical, cognitive, emotional support.

The **takeaway from this chapter** is that collaboration under uncertainty was most enjoyable when it gravitated around *direct involvement*, *mutual support* and *curiosity*. The renderings show that evolving among existential components in response to circumstances is most rewarding. The renderings were able to identify four distinct adjustment strategies among participants and confirmed how more *relationally* oriented participants bolstered their positive outlook and enjoyment over time. Collaborators able to resource from a wider spectrum of existential repertoire and transitioning approaches were likely to stay more motivated and committed. Through facilitation of reconnection opportunities (formal and informal 'touch-downs') in group and dyad, as well as alternating action with inaction, the social buffering is established conducive to such existential motility.

6.4.4 · Further directions

Adventure renderings provide a model to understand motivational dynamics in communal engagement. They are a means to bring more clarity into experiential influences and mental adjustment dynamics in the face of joint disequilibrium. This annotated visualisation model adds existential dimensions and awareness for improving coordination of interests, efforts and affect in failure-friendly and explorative learning situations.

With the study's limitations in mind, future studies should develop more systematic method for evaluating participants' existential aggregates and mental flourishing under uncertainty. This could be done by complementing interviews with self-reporting online surveys at regular intervals and with scales in place. Thereby an average score can be obtained and

fluctuations over time better observed. Also, efforts and outcomes could be standardised for more accurate comparison. More impartial instruments for assessing daily existential pursuits, such as the depth and level of task-activity engaged in. Future studies should also sharpen the focus by specifying the qualities of personal adaptability and flourishing under uncertain collaborations.

In the previous chapter, the study was ethno-pedagogically evaluated from the self-declarations of participants and then analysed in combination with their experiential expressions. This chapter looked at dynamics of mental flourishing under uncertainty. In the final chapter we draw from both analyses to summarise what made participants stick to adversity. How pedagogic collaborativeness and existential journeys have fused to adventurous homemaking.

Integrative Flourishing

We need to find a new way to know and grow food,
as a new way to understand ourselves and
how we as bodies relate, politically
to the social world we inhabit.
Perhaps fermentation as a metaphor will enable us
to know the things differently.
—Melanie DuPuis (2015:160)

This chapter seeks to learn from fermentation – as metaphor and socially applied technique – to draft a vision for design as practice of *integrative* flourishing.

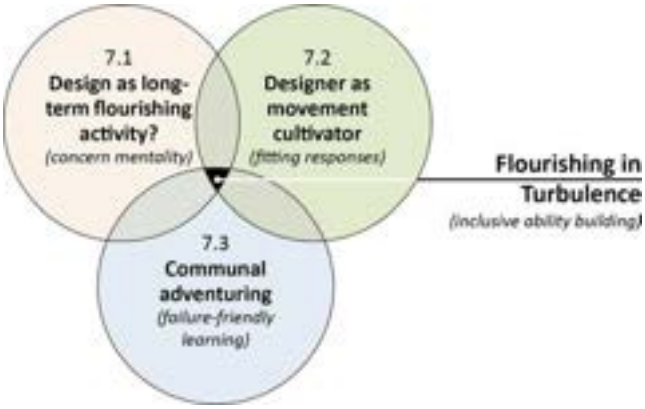
The study set out to mobilise flourishing dynamics between people *and* plants—within a consequential foodloop. This integrative exploration was situated in peoples' daily life, pulling together bacterial cultures, baby plants, and home routines into one working alliance. It was an attempt to foster – on minute scale, together with 22 Hong Kong households – "pluriversal openings" (Escobar, 2018a): the joint unpacking and finding process for making better informed choices.

Design in this study was understood as decision-making activity for flourishing that emerges from *inside* out. This collective bolstering of internal resources was expressed on three levels: (1) Stirring in people the desire to upcycle effluent nutrients from their metabolising body; then (2) empowering them to grow plants out of it; for (3) exploring more pluriverse engagement models for *inhabiting* complex situations.

The adventure did not end there because two things happened. First, the form-giving design intentions with the foodloop system failed the participants, since plants mostly perished. Secondly, despite the technical breakdown, the group of 22 aspiring homemakers kept flourishing in the ensuing six weeks of turbulence. When the form-giving leg collapsed, the collaborative leg of design has allowed for versatile learning to unfold.

Deriving from the findings is a proposal for design as *integrative* flourishing practice, presented with the three conceptual lenses of this thesis with the Venn diagram below (figure 68). Relating to the existential factors, elaborated in the previous chapter, the major themes for this conclusion are (7.1) perspective of interexistent autonomy; (7.2) competence through self-control; (7.3) engagement in relationality; and (7.4) integrative flourishing when all these aspects come to fruition *together*.

(figure 68) **Aspects in flourishing-concerned design**



The findings of this study are summarised in a recommendation for design understood as a flourishing practice (7.4) that makes room for a concern mentality (7.1), responsive practitioner (7.2), failure-tolerant engagement.

Flourishing from the Latin word *florere* for 'blossoming and being prosperous' used as intransitive verb is figuratively imbued with life-supporting cooperation. The plant's unfurling blossom is part of a self-regulatory continuum where bringing forth fruits and seeds – new life! – implicates the participation of diverse players: plant, sun, pollinators. It also entails the blossom's own *disintegration*. Flourishing then stems from adeptness in regard to others and finitude as the bargain of interexistent prospering (Stevens, 2015; Wahl, 2016).

This flourishing in otherness also entails coordinated movements such as pollen transfer or seed dispersal, by engaging unlikely partners like flower pistil, wind, and wasps. If integrative flourishing has relevance in design, then disintegration – giving way to new life – is implicit to mutually life-supporting engagement. Flourishing in design then is not just about mental attitudes of prefiguring, anticipating, conversing, nurturing, and maintaining, but also necessitates stunting, languishing, ceasing, losing, perishing and failing.

7.1 · Design as *integrative* flourishing practice?

The study's main intention (1) was to explore collaborative craft approaches that instil **acceptance** and deeper commitment for re-engaging with human 'waste'—as means to relate to biological self and otherness. In regard to acceptance, one subsidiary intention (2) was to examine the conditions of socio-material engagement to **transcend the stigmatisation** of human 'waste' into the impetus essential for pulling it back into daily life—"recoding" (Fry, 2018) it from disgust to desire. In this reclaiming of *biological humanity*, the other subsequent intention (3) was to better understand the collective dynamics that foster deeper and **durational commitment** in individual collaborators since fermentation and planting processes *take time*.

7.1.1 · Flourishing in challenge/support pivoting (main learning)

The main learning (1) is that craft approaches which simultaneously foster potential in participants' self-coherence, competences and relationality can establish a continuum of value creation where human 'waste' is integrated in the proposition of flourishing together. Quintessentially, the flourishing potential in human 'waste' and in persons is about being implicated in a symbiotic self-regulation dynamic (creative tension) that reconciles the pursuit of life-asserting impulses (*desire* of proliferating life and wellbeing) with the generation of meaning over time (*duty* of accomplishing the processes involved). Facilitating this **desire and duty matrix** aimed at integrative flourishing, is a delicate balancing act between the **agency of support** and the **agency of challenge**.

Agency of support (in the *world of eaters*): This relates back to the first subsidiary research intention (2) of reconciling a mutually beneficial narrative with personal relevance. Humans have an insatiable need to complete meaning. Collaborative situations that are socially integrative in regard to knowledge exchange and control over multiple activity domains, provide this meaning-completing dynamic. In other words, the topic (reintegrative human 'waste') was evolving in response to participants' concerns, who exercised self-control in relation to the contingent dialogue. Persuasive in this study was the concept of *integrative biopedagogy* which afforded bargaining alliances with ambiguous partners (inconclusive peers, processes, and props). It provoked revelatory encounters with own habituation, suspicious family members, diverse peers, exuberant bacteria, and volatile plants—all

embarked on thriving together. The most relevant social support for self-support originated from the cascade of interpretative openings that such unlikely partnerships imbue.

In this broadening strata of sensemaking that human 'waste' upgrading entailed, the participants' reasons to stay committed could transition over time. Initially, there were external interests, then personal ambitions, eventually relational openings. The initial enticement was raising plants in urine, then personal motivations sprang up for overcoming the struggle, to eventually establish cohesion with fellow adventurers.

Employing purpose and devotion, the stratified sensemaking outlined a harm-aware collaboration for interlocking value creation with biophysical nurture. As evidenced by agroecological design mobilisations in Europe (footnotes in 1.3.2), human 'waste' embedded in flourishing collaborations can be a desirable and convivial proposition (Sturzenegger, 2017; Reynaert, 2016; Karga, 2014).

Agency of challenge (in awareness of harm): This relates to the second subsidiary intention (3), which was adopting mutually beneficial interests for overcoming obstacles together. Humans are most responsive to what speaks to both the ambitions of their higher self and the immediacy prompted in the present situation. The agency of challenge in a turbulent collaboration stems from the dynamic arising in jointly encountered ambiguity, overarching goal pursuit, and the urgency imposed. In this suspension of status and convention, fresh opportunities spring up conducive to sociality, learning, inventiveness, and rich interpretation.

This self-contracted, joint goal pursuit keeps humans in close, bodily exchanges with their environment when there is room for existential ephemerality – *generative* vulnerability – as the catalyst for honest insight, solidarity and greater choices. To better grasp the existential dynamics in experimental collaboration, this study has established analytical *adventure renderings* for correlating self-support and societal internalisation with observable adeptness to the challenges presented. Adventurous collaboration brings participants into an arena of courage and endeavour that is larger than themselves, thereby circumventing the operational logic, and unleashing untapped, adaptive responses.

There are unresolvable challenges that make human 'waste' into a lasting adventure. While sensible fermentation processes adequately sanitise faecal matter and urine (Krause & Jacobsen 2011), its environmental toxins and legacy wastes contained, are limiting the regenerative use to non-food applications. Mindful to contaminants migrating across inner and outer ecologies, there are still numerous applications where human 'waste' can play regenerative roles. From desert reclamation, post-wildfire re-forestry, natural reserves building, native tree nurseries, long-stemmed orchards, bio-fibre production, to city and zoo landscaping. Human 'waste' is an intriguing design material since it epitomises with its intimate biophysicality, the harmful disconnects in mainstream homemaking, interlocking inner and outer flourishing.

7.1.2 · Transparency and selforganisation

The study revealed how *joint ambiguity* in conjunction with the *integrative goal* has held participants together, helping them flourish in turbulence. A chaotic situation encountered *alone*, is likely to be just irritating. Yet, in the commitment of the group, responding to the situation has resonated with individuals. In what this study identified as *explorative collaborativeness*, adapted from Aini-Kristiina Jäppinen (2016), the occurrence of undeliberate adversity in dynamic relation of the overarching mission made "control thinking" (Fuhr & Gremmler-Fuhr, 1995:28) inadequate and necessitated ad hoc decision-making in the bathrooms and group exchanges.

In what emerged as self-governing domesticity intervention, facilitators had to relinquish control so participants could take charge. Yet, the explorative alliance did not end up in chaos or anarchy. Panarchy was behind flourishing in turbulence, a bargaining partnership among participants (human or not) from the dynamic continuum of transparency, selforganisation and internal motivation (Carolan, 2016b; Le Heron et al, 2016; DuPuis, 2015:158). Panarchy was not a chance occurrence, it was facilitated on three integrative levels of stipulated agreement, nested tasking, and situated responses.

Stipulating agreement: Collaboration in this study entailed to clarify from start to finish the purpose, possibilities and limits while keeping them open for negotiation. During intake interviews the ground rules (e.g. minimal attendance requirement) were agreed, yet the participants maintained their right to withdraw from commitment at any time. The given

rules were subject to the understanding, agreements and decisions, both from the group as well as the individual. For example, what was originally declared a citizen science project, could be interpreted differently as horticulture class, social experiment, or civic contribution. This open arrangement under mutual probation made room for negotiation in the self-obligated, overall pursuit.

Nested tasking: While the biweekly workshops offered the thematic scaffold, the actual tasks were implemented at home, so individual goal setting was up to participants. The workshops proposed purposeful activities, consequently the actions taken were monitored by the group, while the responsibility for getting things done had ultimately the participant. In what in Adventure education refers to as “challenge by choice” (Schoel et al., 1988:130), the peer-to-peer interviewing exercise in each workshop and the journaling at home encouraged participants to keep track of their own advancement while eliciting mutual feedback. Nested tasking also shaped the workshop structure where self-reporting and substantiated involvement prompted participants to account for outcomes, take initiative, and make decisions.

Situated responses: Many unresolved aspects were inherent to the experimentation, like leaking urine tubes, confusing biopedagogic readings, undecided choice of seeds, or the lack of automised root aeration. Participants were provoked into gap-filling of the faulty system which is known as “playing with the imperfect” (Gaver et al., 2003). Participants and group needed to reorganise themselves in order to improve the situation. According to Gestalt practice, gap-filling can yield the most energetic kind of volition where “self-regulating action […] is brighter, stronger, and shrewder” (Perls et al., 1951:324). In the ensuing uncertainty of the gap, participants had to reorganise themselves to establish some kind of stabilisation. It is at this suspending moment between unresolved and balance, where new insights gain foothold. Such breakthroughs in the moment of the strange are only realised to the extend they are perceived and made aware of (Perls, 2005:109).

7.1.3 · Support ecologies

Experimental collaboration is confrontational and demanding. Working through incomplete situations, overcoming obstacles can be daunting. Withstanding challenge requires mutual attention and support. The study established a supportful ecology over time spanning across workshop lab, facilitator's office, and messaging group.

When the plants – exposed to too much harm – perished, focus turned to reducing harm in humans. Participants stayed unharmed, mostly flourished since failure was (1) nobody's direct fault or misgiving, (2) was encountered in the diversity of the group, (3) was seen as relevant obstacle toward reaching the larger objective. The obstacle gained relevance since it engaged the senses, hands, and minds of the entire group. Failure was socially buffered because eliciting control was mutually reflected and acted upon. The shared grasp of moderating trade-offs and efforts, therefore remained in relation to the larger objective.

The support ecologies also ensured that failure was confronted and learnt from (rather than avoided) through means of deliberation – journaling, expertise-sharing, group reporting. Recognising mental flourishing as pivotal in collaborative processes, unleashing the fuller potential in individual and group stems from existentially integrated reflection where rational distance is correlated with the reality of emotions, sensations and bodily involvement for grounding the evaluation in the present (Rahm, 2004:164).

Establishing a solid rapport rather than care: Participants who struck up rapport with others were able to elicit the support they needed. As indicated in Gestalt practice, to establish self-support, people need access to support from their environment. Conversely, participants who solely focused on helping others, and lost track of their own needs, could easily lose this self-support. Support then is about help that remains integrated and responsive simultaneously to the needs of self and others. This instantiated, integrative help, thus necessitates a solid self/other rapport. *Rapport* from Latin *apportare*, 'to carry and bring back an agreement', describes how in turbulence self-support relied on concurrently revalidating expectations, success rational, and the viability of human connection. The study showed that there is an important distinction to be made between caring and supporting. The desire to be helpful that lacks this instantiated rapport, can lead to an isolating diligence and frustration (6.4.2). Caring solely from a static position of obligation did not leave room

for critical reflection. Care therefore is an ambiguous concept as literature indicates (Puig de la Bellacasa, 2012) and not a reliable predictor of deep commitment.

7.1.4 · Uncertainty and harm as mobilising concern

Gathering participants around a shared concern was essential to unleash capabilities and potential as indicated above. Exploring hydroponic planting powered by one's own urine, made tangible how far removed humans are from their biophysical foundation. In absence of (edible!) results, tolerating uncertainty was possible because a self-assertive task with attention to process. Embarking as a group onto an unusual, self-appointed journey together (closing the foodloop), could be seen as accomplishment in itself. Ruth Cohn's (2016) Theme-Centred Interaction indicates how raising issues of shared concern is crucial since people ordinarily are conditioned to achieve results.

Engaging with the fragility of life in the study was understood as concern and not a risk. People are challenged to personally engage with uncertainty (such as climate change) that is considered abstract, remote, or too overwhelming to tackle (Barberis, 2013). Only what arrives in the contingency of present observation and validation bears the potential to be deemed personally relevant, or what John Dewey (1997) calls "extracting meaning".

Collecting, monitoring, fermenting, fertilising urine became an engagement mode with the world that simultaneously was about influencing and being influenced. In this harm-aware concern for the inherent instability of ecosystems one depends on, potentially harmful actors engage in bargening relationships with each other to reduce the harm overall. Flourishing in the face of fragility is thus about the shared concern of limiting harm. When the misconceived product design did harm to plants, the human alliance was tasked in inflicting no further harm. When plants perished, people stayed in relational motion to each other, thereby seeding new plants.

Concern derives from Latin *concernere* for 'sifting together'. The word harm stems from Old German *harmaz* 'pain, hurt, grief'. The concern for harm therefore can be understood as 'belonging through shared agony'. Nurturing beans from own urine, visually correlating plant and human anatomy, and aerating oxygen-needy plant roots by mouth, can be understood as body-aware measures of concern mobilisation. The study's intrigue was that doing harm

to others could do direct harm in oneself. The participant inadvertently ingesting flu medicine during urine collection, grew concerned about the biochemical feedback from his urine-born plants.

In this study risk-taking was kept in check through continous relation to harm in self and others. Each participant had the ultimate responsibility to what degree to engage with tasks, where to find safe storage for urine ferment, how to communicate the project with family (or not), what changes to implement in personal diet, or if urine-grown crops could be consumed (or not). Adventurous emphases unpredictability and harm awareness over risk. It works on the basic tension of spontaneity and constraint that engenders the confirmation of connectivity where withstanding adversity is imbued with intensity, clarity, and vitality.

7.1.5 · Human frailty as creative wellspring

When personal growth is viewed in direct relation to its decay, then flourishing in human activity is about *limiting harm* as the primary, collective concern (Stevens, 2015). In this study it meant to let go of the controlling mentality aimed at securing yields and stabilising health states. Instead, participants and facilitators needed to stay in moving relation to the processes unfolding in peers, plants, and bacteria. Rather than zooming in on the cause behind floundering plants, obtaining a fuller understanding of underlying conditions proved constructive. Rather than finger-pointing to what was not working, failure was perceived as first step to advancement.

Flourishing in this study stemmed from decisive moments of personal integrity. Already on day one, the researcher was forced to let go of expertly pride and concede to personal imperfection. Being unable to deliver to the standards the study aspired to was painful, because in a perfectionist world, by overtly failing, the designer fears to sink into oblivion. Achieving perfection is perceived as the prerequisite in the quest for self-validation and belonging. Failing to live up to fixed standards, in conjunction with hiding shortcomings, actually can be isolating and obstruct the way for spontaneous possibilities.

The most insighful moments arrived when unpredictability was confronted with an inward-looking clarity combined with outward-oriented connection. The study was marked by such “figure/ground” moments—revelatory awakenings (Tropianskaia, 2017; Brown, 2012; Perls,

2005:89; Proudman, 1995). When participants experienced facilitators as existentially porous, vulnerable humans, they could open up themselves as well and enter a human alliance – the camp experience – which could transcend boundaries. It allowed participants to become adversity-tolerant, reveal confessions, or pursue daring experiments on their own.

The study was temporarily able to provide the social buffering for entering joint exploration without defensiveness getting into the way. Gestalt practice refers to this essential human capacity as being “porous yet not woundable” (Tropianskaia, 2017). In a culture that operates with polarisations of weakness and strength, defence and attack, vulnerability is fraught with negative connotations. Yet, unless there is more courage to engage with this harm awareness for inner and outer ecologies, the prospects in human-environment interactions remain stunted. Bringing awareness to this critical-generative vulnerability, the analytical rendering models (6.4.1 and 6.3.1) sketched out in this study, attempt to link this human porosity with prosocial potential. By visualising the complementary relationship of experiential dynamics in collaborative situations, the dynamics of creative unblocking in groups and individuals can be better understood.

7.2 · The practitioner of movement cultivation

Human activity triggers increasingly vast flows of ideas, data, material and people. Much of this designed outflow seems to lack coordinated movement. In integrative flourishing, flow is not the same as movement. Flows are streams of high quantities—movements result from the contingency of time, effort and flow. Movements are directed in relation to resistance, while flows are indifferent to them. Coordinated movement affirms or stretches boundaries, while uncoordinated flows overrun or violate vital borders (imperative limits). On the bodily level, it is the anticipation of such violations, the awareness of pain, harm and frailty that signal to the practitioner how to adjust in adept ways to the situation. The flourishing-oriented practitioner then is a cultivator of concerned movement for honing such integrative intution.

This unblocking of concerns through engaging with them was a profoundly embodied and senses-led experience. It entailed agitating stem cultures, incubating urine, implanting seed plugs, rotating compost—thereby sensing harm. This bodily participation in the world, is the foundation of a knowledge where all matter, including human bodyminds, exists in dependency "to a movement matrix from which it emerges and into which it disappears." (LaMothe, 2015:25). The rhythmic meshworking with other life forms as resource for human development entailed circadian rhythms, fermentation cycles, aeration intervals, urination events, journaling interference, and group touch-downs. The flourishing-led practitioner then tries to cultivate a measured degree of pain, harm and frailty that the unregulated flows are creating – waste, destruction and violence – as living stimulant for reintegrating human activity into the life-supporting movement matrix.

7.2.1 · Coordination of collaborative impulses

The job of the movement cultivator of these developmental circulations (from fermenting successions to cyclic reflections) is then to keep track of the quality of impulses in group, people, and other life forms for monitoring blockages and overruns in their existential constitution. Key organisational aspects in coordinating such collaborative impulses were relinquishing fixations, action/reflection sequencing, tandem trialling and constant rapport building.

Relinquish fixations: Integrative flourishing is about the coordinated realisation of potentials inherent to the present situation (Sonne & Tønnesvang, 2015), less about ideals, hopes, good intentions, and value judgements—normative fixations. In hindsight, the study's Upgrading Ventures (chapter four) were initially too focused on external expertise, and not enough attention was given to local knowledge. Gradually the study had to relinquish preconceived ambitions, and spin a web of relational probabilities across different life domains (chapter three). Similarly, participants had to curtail efficiency thinking, and make vital connections with what was collectively present. Rather than getting stuck in disappointment, entering adaptive relations led to transformation.

Action/reflection sequencing: In this process-driven practice, the reflection in, and upon the unfolding experience is of primacy, because bringing out peoples' potential relies on a situation-by-situation adjustment. For this reason, action-packed workshops alternated with

periods of homebound tasks, and material engagement was contrasted with shared reflection. The workshop curriculum was not overly structured to provide a balance between outgoing involvement (like collective sauerkraut making), and low-profile activities (like mini-lecture). Real learning – breaking into new territory – takes hold when there is room for awareness building. In experiential education this sequencing of activity and debrief is referred to as "adventure wave" (Luckner & Nadler, 1995; Schoel et al, 1988:27).

Tandem trialling: For keeping up with ongoing developments in the biopedagogical experimentation, facilitators subjected themselves to the same tasks concurrently with all participants. This was crucial to remain sensible to their experience and be responsive when the situation demanded it. When practitioners move in tandem with collaborators, they can claim "the role of a companion in a joint adventure" (Gilsdorf, 1998:11) which is the most effective way to grow working relationships.

Constant rapport building: Working relationships grow along the continuum of reconnecting. Aside from intake and exit interviews, there was time reserved for regularly touching base. During these participant-led questionnaire segments, facilitators were able to step back and eavesdrop on peer-to-peer conversations. Being shorthanded, the facilitators were too absorbed to stay personally touch with each participant on a regular basis. This could have helped to avert distress in some, by clarifying mutual expectations and assess ad hoc coping approaches together with the analytical rendering models as mutual discussion guide.

7.2.2 · Accountable adventures

Adventure renderings (6.4) bring basic emotional polarities into an open-frame, interpretative model to understand the dynamics in the existential currents of the individual. Integrating prosocial and isolating existential expressions holistically on a visual spectrum, emphasises how they are the phenomenon of complementary relationships. It means that in seemingly negative existential currents there is always the potential for reversal into its positive polarity (Sonne & Tønnesvang, 2015).

The evaluation among 17 study participants showed how diversified, existential motility – self-coherent mental adaptation through multidimensional, social integration – was most

helpful, even rewarding, in overcoming obstacles. The study identified how existentially essential to mental flourishing in unpredictability were the desire for rediscovery of the self (curiosity), validation from shared responsibility (direct involvement), and contributing to the backing alliance as stabilisation in turbulence (mutual support). Rendering this existential motility early in the process endorses adequate adaptation strategies in group work.

Moving from fixations of the materialist paradigm, to a dynamic, flourishing-oriented integration will require a lot more experimentation in joint creative processes. Each given context calls for its specific movement arrangement. Adventurous homemaking that correlates home with biosphere, science with art, and integrating economies with long-term flourishing has certainly calls for continued communal mobilisation.

7.3 · Practice of communal *adventuring*

This study was concerned with urine sequencing, fermentive rhythms, sprouting cycles, experiential transitions, challenge/support oscillation, and activation successions. What held these movement patterns together was identified as 'explorative collaborativeness' in chapter five and existential motility in chapter six. Explorative collaborativeness was found to be the pedagogic dynamic where social buffering with constant nurture and synergy creation made it possible for the peer group to enjoyably persevere vis-à-vis adversity (5.4.1). The psychodynamic equivalent in individuals was found to be 'existential motility' where curiosity, direct involvement and mutual support were the core existential factors that held participants together in the adverse (6.3.4). Put in relation, biopedagogic and sociopsychological flourishing in turbulent collaborations then stems from the adeptness of (re)constructing reality, both suitable to person as well as situation. The correlation of explorative collaborativeness and existential motility is in Adventure education synthesised as dynamic tension of the "unfinished situation" (Fürst, 1996:34; Portele, 1992), the organismic principle of selforganisation in evolutionary processes of all living systems.

Homemaking mastery: Engaging with the unfinished situation calls for a practice that functions in the tension between "directivity and non-directivity" (Gilsdorf, 1998:10). Directivity comes from proposing integrative, potential expanding visions; and non-directivity from inviting diversity to ensure the possibilities are mitigating possible harm. In the realm of collaboration, "collage-making" (Huybrechts et al., 2014; Muller, 2002) is the expression of an unfinished situation: the vital dynamic holding together a myriad of components from disparate contexts. Health concerns, family life, eating patterns, sanitation, microbiology, weather conditions, vegetal affections were fused into one mission. Participants were confronted with various fields they do not belong to, thereby brought deliberately into uncertain positions likely to unbound status, conventions, and learning.

This collage-making practice proposes a fuller participation with the world by expanding the psychological concept of "environmental mastery" (Yi et al, 2014). Unlike control, mastery is the capability in people to act on their own behalf in suitable response to the situation. It is the antidote to withdrawal, or "the minimal self" (Lasch, 1985). If this concept is expanded as homemaking mastery, then people learn to flourish in adeptness with the ecological condition, as metabolising bodyminds who are inhabiting the world. The prevalent, existential homelessness (Fry, 2005:195) of worldly exclusion is the ultimate 'unfinished situation' to confront. It means to integrate, stay in motion and not paralyse.

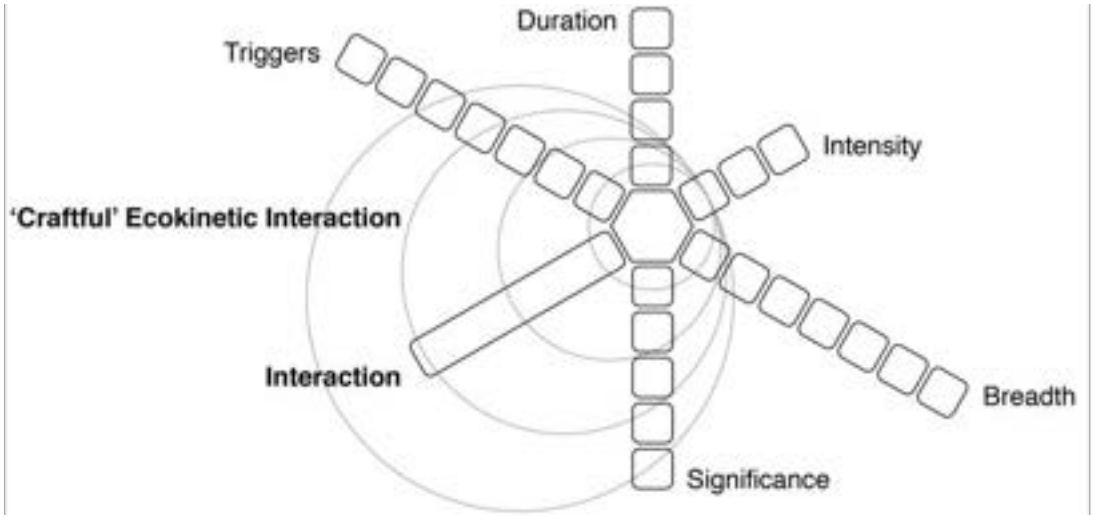
From experience to integrative design: This study took inspiration from flourishing concepts in psychology, anthropology and pedagogy with implications for design practice. People flourish best over the long haul by self-regulating the movements of their bodyminds in constant relation to otherness. Yet, a lot of movement regimes tend to be restricting in an effort to cushion people from pain, resistance, controversy, and duty. Experience design applies research, inspiration and technology to understand and shape the human experience in given situations. In this scenario, people are being moved to arrive at certain meanings. Nathan Shedroff (2006) has outlined 15 core meanings that encapsulate people's goals, needs and desires which are listed (table 15) in the left column.

(table 15) **Core meanings in experience design** (Shedroff, 2009) **and flourishing-oriented equivalent for *experiential design***	
Experience Design (Shedroff, 2009)	**Experiential Design (*'ecokinetic')*** *—work-in-progress*
Accomplishment	acquiring adeptness
Beauty	resonating presence
Creation	fostering flourishing, limiting harm
Community	making contact
Duty	pursuing commitment
Enlightenment	reflecting critically
Freedom	liberating relatedness
Harmony	opening multiplicity
Justice	integrating otherness
Oneness	engaging intimacy
Redemption	overcoming resistance
Security	bargaining for safety
Truth	fathoming frailty
Validation	stirring curiosity
Wonder	regenerating awe
Experience design aimed at moving the experience to stabilise and enlarge the self (left) and flourishing alternative that situates the self in coregulating movements (right, 'ecokinetic').	

From a flourishing vantage these 15 core meanings (all nouns) delineate aspects aimed at stabilising and enlarging the self with rather replicating, divisive movement patterns. These meanings resonate with an individualistic, self-contained self. In contrast, an integrative flourishing approach would address these meanings from a self, situated in coordinating relations with others. The experience here originated from movements inside resistance, concern, and suspension as signifyers.

Economic activity aimed at enabling flourishing is integrative to people, living organisms, species and ecosystems by limiting harm to the absolute necessary. It would mean to cultivate industries that are harm-reducing, thriving on self-regulating dynamics of adeptness, skills and devotion. Robert Stevens (2015:210) describes how in such adept engagement, the frail, mortal human body moves and expands in shared interaction with the living world represented in the next graphic (figure 69).

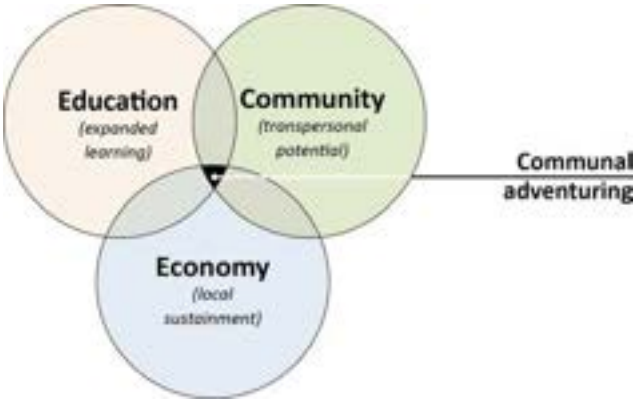
(figure 69) **Six key experience dimensions (Shedroff, 2009) adapted for flourishing-oriented *experiential design***



Expanding the autokinetic dimension of Interaction (6) with 'craftful' ecokinetic expansion.

Extending adventurous scenarios into other activity domains can be anchored in the core lenses of this research. Education is the stage of learning where ecologies of knowledge constitute reference and context of the work. Community contains the interexistent collaborative potential, the socio-material processes that rely on expanded learning and on natural ecologies. Economy here is interpreted as the contingent relationship between learning and community. Here knowledge and activity work together on integrative flourishing as illustrated in the following Venn diagram (figure 70).

(figure 70) **Scaling this adventure for homemaking probabilities**



The ability model *introduced in chapter one can be applied beyond this study for contemplating long-term, social transformation processes.*

This study was driven by the question what if design would be an flourishing-oriented homemaking practice, more so than a worldmaking or form-giving trade. By mobilising harm awareness, failure tolerance, and generative vulnerability in relation to the unpredictable, a humble rendition of adventurous homemaking was alluring enough to pull 22 participants into fuller participation with themselves, the group and social learning dynamic. With insights, relations and momentum gathered in this study, more adventurous probabilities are in the working.

7.4 · Next moves

Flourishing societies grow out from the well-adjusted, volitional dynamics of its individual members (Sonne & Tønnesvang, 2015). Future research therefore will continue to explore relational motivations and experiential wellbeing of people in practical, mutually beneficial, integrative collaboration concepts. For bringing more clarity into the interexistential dynamics of such challenging joint processes, the analytical engagement model established in this study will be advanced and implemented.

Pivotal for integrative flourishing research is a mobilising proposition – i.e., providing for the *world of eaters* – where all parties are brought into uncertain positions for unleashing potential of renewal. Building on the coevolutionary abilities of human 'waste' and bodyminds, two lines of research are pursued. One is advancing the biopedagogic nutrients upcycling, the other is investigating body-aware strategies in communal reforestation efforts.

7.4.1 · Advancing communal biopedagogies

This research has co-developed an indoor horticultural system for the biopedagogic use of urine on household-level. Small crops are grown out of fermented, odour-neutralised urine for the purpose of linking personal eating/living behaviour with the flourishing of plants. After the inaugural trial in Hong Kong (spring 2017) that technically failed, a successive trial conducted by affiliated product designers in Eindhoven (summer 2018) led to the redesigned personal foodloop kit (ANTHROPONIX 2.0) that reliably produces herbs and salads.

Currently this system is further standardised into a self-implicating, biopedagogic instrument. Such 'life-giving' monitoring of eating behaviours is provocative since drug residues, enviro-toxins, and microplastics (Liboiron, 2013) will be of growing concern. Future research in this biodynamic lifestyle-tracking will explore what forms of communal engagement endorse integrative behavioural adaptation. Gaining insights from urine-upcycling participants, the biopedagogic instrument wil will be explored to examine the emotive forces and abilities emerging in this human-plant continuum.

The ability-expanding biophysical mobilisation needs to go beyond critique, advocacy or education, and expanded onto strategies for integrative, citizen-led agroecological commitment, explored in the second line research.

7.4.2 · Communal agroecologies to buy climatic time

The pressing challenge is the cultivation of human self-regulation that adequately contributes to cooling the planet. Well-coordinated commitments are required so that every human bodymind can deliberately participate in slowing down climate change. One sensible way forward, is to reduce the amount of heat being absorbed by the landmass. It means to cover Earth's surfaces not with concrete, but with living soil and breathing forests. Most agricultural land, and the urbanised, heat-trapping surfaces are pushing rain away, thereby emitting vapour that is responsible for half the greenhouse effect (Triacca 2014). In contrast, forests invite the rain through evaporative cooling. It makes therefore sense to reduce hard, hot surfaces, and boost terrestrial biomass production by regenerating soils, and planting (food) forests (Rockström et al., 2017; Hansen et al., 2017; Smith et al., 2015).

In a long-haul, accumulative research effort, a creative framework for communal soil stewardship and tree planting will be pursued. Informed by ability-oriented, communal practices that merge social and environmental issues, mobilisation strategies will be explored for engaging human bodyminds in the regeneration of local landscapes and integrative economies. Such "socionatural meshworking" (Ingold, 2011:63), integrates 'waste' treatment with soil stewardship, climate cooling, local industries, and interexistent flourishing.

●

Flourishing practice as harm-aware mobilisation? In its transitive meaning, the word *flourishing* takes on a decidedly activist notion. Flourishing as in 'holding up the hand and ostensibly wave—potentially with a weapon', is about setting a clear signal for changing course of action. In this (non-flowery) sense, flourishing postulates an imperative. How would such flourishing-oriented design then permeate human activity and decisions? Arturo Escobar's (2018a) autonomous designer is expression of the mobilised and mobilising flourishing practice. This study attempted to set a signal for harm-aware adaptations with homemaking as social enactment of future probabilities.

This research was an attempt to bring more clarity into the existential dynamics in individual and group. Gaining critical awareness to the many perspectives in complexity constitutes the most important step toward change. There is no development without this self-reflexive insight of what is. By acknowledging what it is that is unfolding – in person, group, and situation – openings are presented for dis-identifying with the identified, thus, changing course of action.

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APPENDIX — CHAPTER 1

Publications & Papers

Cultivating More-than-Human Lifeworlds: Laudatio on Indigenous Fermentation, Smell and Metabolic Power Grids

In O. T. Leino (Ed.), ISEA2016 Hong Kong 香港 CULTURAL R>EVOLUTION (pp. 360–364)
22nd International Symposium on Electronic Art, 16-22 May, 2016.
Hong Kong: City University School of Creative Media

Markus Wernli

Abstract: What are ethical and species-affirming approaches for how humans, can relate to *you*, the fermenting *Lactobacilli*? In pursuit of this question, *you*, the single-cellular life forms inside living machines and bioartistic events are invited to join the animal party! Just because human animals neither have the sensorium nor the empathy to grasp *your* lifeworlds [1], does not mean they can keep ignoring *your* presence. Biophysically, *you* are already everywhere the human animals are; in their breath, on their skin and inside their guts and yoghurt. [2] Before they know it, *your* 'micro-metabolic power grid', might even charge their electronic gadgets. [3] *Lactobacilli*, it is not enough for *you* to be their workhorse. For human animals to keep their future options lively and open, *you* need to become their role model. They can learn from *your* synergetic, cultural manipulation and coalescent social work. Teach them how to be a playful companion dweller inside this planetary home!

Open-source tech for cultured meshworks: Hello *Lactobacilli*. *You* belong to a humongous con-glomerate of bacteria and yeasts, able to convert sugars into acids, gases and alcohol. The latter apparently is of significant economic value to the human animal. [4] *You* help upgrade and distill putrescible, organic materials into priced commodities to feed 'domesticated' animals and even 'biofuel' their engines [5]. It is a highly shielded, mono-cultural process, they call 'industrial fermentation'. Many of *your* microbial colleagues are the invisible workhorses of human animals, diligently in service for *their* rather restricted economy [6].

Outside the brewery and fermentation lab *you* can consider yourself a lucky, metabolic agent. As enabler of a wide open, socio-ecological technology, *you* stimulate and balance the energy flow between animal and plant life. *Lactobacilli*, you are amazing. *Your* vast fermenting tribe is fairly selforganised but *you* are very good at joining forces across the species' boundaries. *You* developed an affinity for the human animal – despite its self-centred, dominant stance in the world – which over millennia, has acquired refined techniques to cultivate and nurture *you*.

By default *you* are a feral and indigenous agent, piggybacking on air, plants and animals, always ready to inoculate and perform *your* act of "controlled rotting" [7]. *You* are easily attracted by moist flour, rice starch, lactose-rich milk; or to be found right inside the cabbage leaf and ginger root. With purposeful agitation, bodily warmth and airtight containment *you* thrive and reconstitute the fragile harvest of photosynthesis into stabilised nutrients circulations. *Your* intelligence cannot be captured in human terms but *you* demonstrate a consciousness for contextuality [8] and a group spirit that is feeding into symbiotic techno-body-culture relationships. How intimately life-forming *you* are is evident when pediatricians collect *you* from vaginal mucus to 'inoculate' human newborns delivered through caesarean section with *your* immunizing microbiota [9] [10]. With enormous *lacto*-bacterial populations inhabiting them, maybe the human animal is better referred as 'homo bacteriens' [11]?

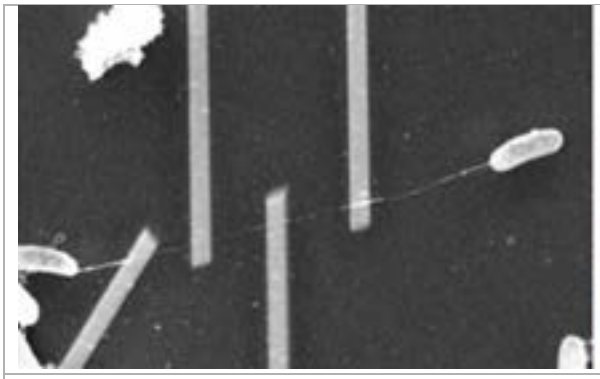

Fig 1 (left). The Mysterious Electronic World of Microbes: Conductive nanowires, measured by electrodes, connect bacterial cells, 2014. Image (light microscopy, 1000x magni-fication): Moh El-Naggar.
Fig 2 (right). Fermentophone: Generative, edible, musical instrument performed by living cultures of bacteria and yeast, 2012. Installation and photograph: Joshua Pablo Rosenstock.

Bacteria-human interfaces: *Lactobacilli*, except for 'Fermented Spider Eye & Brown Mushroom' in their game named Minecraft [12], *you* do not have (yet) any buttons that make *you* 'click'. Instead *you* respect fine protocols of order and cleanliness before becoming 'messmate' or partner in crime with the human animal. This is the *milieu* where boundaries between the tamed and the wild cultures are reconstituted. Artistic types among the human animal call this fermentation frontier of bubbling and hissing the "ecosystemic and biodiverse interface" [13].

Lactobacilli, you are a much better commu-nicator than the human animal. *You* provide plenty of sensorial affordances to signpost the status of your ferment-in-progress. Besides visual cues (e.g. colourful mold where microbial competitors took over) *you* engage with the psychologically most formative senses in the human animal: touch, smell and taste. If *you* ever wondered about humans' insensitivities, *you* should know, they are currently undergoing an organised, sensory deprivation [14] [15]. Their sociotechnical networks increasingly glue them onto ocular-centrist devices, gradually forcing them to abandon olfactory and gustatory forms of being and relating [16]. *You* certainly command durational, bodily presence from the fermenting human to become *your* teammate. Thereafter *you* have your own ways to reward the noses and tongues with releasing the 'contently sour' signal when, for example, *your* sauerkraut is fermented. In case of unfriendly takeover from less desirable microbes, it will be more of a 'musky discontent'.

No matter how permeably, interacting this bacteria-human contact zone is, *your* single-cellular inner life completely escapes the sensorium and empathy of 'homo bacteriens' [17]. Are there ways for humans to meet *your* 'lactobacillic' liveliness? *You* have a way of relating that is not just about enzymes and inter-cellular dissemination. *You* are content to keep *your* diffusive interactions inside the pickle jar and the colon in private and to yourself. Even state-of-the art, scientific instruments are failing the human animal to really get to know *you*: they capture only observable phenomena of *your* metaphysical processes but not *your* liveliness. They can collect as much scientific data from *you* as they want, it will remain trapped in their empirical bias and the limits of human perceptual spectrum [18].

If science is not of much use, can *you* share at least with the metaphorizing human, what it feels like to be *Lactobacilli*? Would *you* compare *yourself* to a singer in a choir of activated CoolAid, fizzing away in a fishpond? The shortcoming of this humanly referenced metaphor is how it diminishes the unique strangeness of *your* bacterial matters. The human animal struggles to access *your* inner workings in absence of a shared, sensorial grounding. Beyond analogies they seek more contextualised avenues to connect with *you,* approaches that can retain *your* alienness without reducing *you* to a human caricature [19].

Lactobacilli, what can humans who accept their failing knowledge-making capabilities do to attune to *your* deeply alien presence? How can this ethical acknowledgement of difference be something pro-ductive? The fact that *you* and them are highly social creatures might provide one strategy. Maybe single-cellular *you* and multi-cellular human can meet in artful events that bring forward a kind of inclusive, social opening? Samples for such relational-aesthetic inter-ventions might be "odour maps" or "smell games" where networked human noses co-perform with fermenting cultures to constitute embodied food webs [20]. Could these open-ended, more-than-human social "interstices" with *you* foster (human) contemplation on the interactions among its multispecies participants [21]? *Lactobacilli*, *your* subjective cues, so incompatible with human comprehension, can potentially create arresting kinds of relationality, at least in a curated context.

Lets imagine living machines or living art events that do not privilege human intelligibility over nonhuman intelligence. Rather, they may provide social niches of resonance for lingering in *your* wondrously alien, nonhuman, *lactobacillic* lifeworlds. Concocting such experimental, bio-socio-techno powered relations among diverse, mortal organisms could prime the human animal to become a better planetary co-habitant and evoke more-than-human accountabilities [22]. *Lacto-bacilli*, codesigning with *you* also could establish unusually lively and creaturely sites of mutual obli-gation: demanding their critical attentiveness, conscious commitment, and practical labor, *you* can bring humans into vital constellations of care and caring [23].

Lactobacilli, enrolling the human animal into cross-species' accountability will indeed be essential for the huge tasks lying ahead. Not only are *you* meta-bolically tending to nutrients and contaminants, but *you* possess neurological powers for balancing human mental health [24]. *You* are the *in*-spiration for taking part in seemingly unrelated things and mutually enriched relating. *Your* haptic and sensual affordances transpose human and nonhuman knowledge into activated experiences [25]. Call it 'speculative meaning-making fuelled on fructose' if *you* like. Scientific tinkerers among the human animal are trying to remake *your* extended bacterial family into their high-tech innovation partners. *Lactobacilli*, *your* relatives might soon be the self-repairing building blocks for nanomaterials [26].

These 'biofilms' have amazing "metabolic branch points" that are programmable with "regulator molecules" to control their properties. Soon this activated bacterial tissue might help human animals to clean up polluted rivers, even produce pharmaceuticals or textiles. Within its given limitations, the human animal uses electronics to get to know *you* better in what seems less extractive, more sensible-playful ways. *Lactobacilli*, they are sniffing and hearing *you* out. How, for example, do *you* feel about the Fermentophone that derives algo-*rhithms* and bacterial tunes from *your* living cultures? [27] Or what do *you* think about the 'electronic noses' and 'electric ears' [28] that detects *your* bacterial friends in drinking water [29] and in black tea fermentation? [30] *Lactobacilli*, a close relative of yours by the name Desulfobulbaceae even performs as organic transistor, silicon wafer and electric grid all in one. [31] One day, such micro-scale biomachines might generate electricity one moment – to recharge the human animal's gadgets – and produce fuel and raw materials the next. [32] Until such biodegradable electronics become reality, it is wise to keep propagating the brigade of "computer-munching microbes" tasked with the cleanup of an ever-increasing e-waste. [33]

Social interstices of 'cultural manipulation': *Lactobacilli*, you know very well; goodwill is not the same as practice. If *you* are to materialise from the dusty confines of a recipe page into humans' everyday life, social practice is at work. Unless you are accepted into play and ritual, *you* cannot live to your fullest, feral potential inside human domestic ecologies. No worries, this is not the industrial practice, framed by uncontrollable external forces, that sterilizes (aka pasteurises) your precious biota for prolonged shelf life. This is the homegrown, cultural manipulation and internalised practice, where *you* possibly bring out the best in human animals: skill, caring and life-formation. For millennia human animals nurtured, utilized and woven embodied technologies [34] such as fermentation into their everyday. *Lactobacilli*, it is here where *you* make a real difference even in the tiniest refuge of cultural diversity. Be not discouraged by misguided human animals trying to eradicate *you* with germ-killing disinfectants and antibiotics. To the human idealist *your* selforganisation remains contagious. *You* are living proof for how the capacity to act independently, out of 'conglomerative' free choice, never was the sole privi-lege of the human animal [35].

Human 'fermentizens' who collaborate with *you* are thinking and making *with* – not to – nonhuman life forms. *Lactobacilli,* in this more-than-human social work, the question is, who manipulates whom? Here Mason jar, plant material, air, soil, Fermented Spider Eye and Fermentophone become able, nonhuman stakeholders on their own, alien terms.

Best of all, *your* bacterial charm forges unusual connections among organisms, single-cellular or not, technologies old or new, knowledges scientific or indigenous. Human animals call this evolutionary life force of 'coming together' that leaves all participants transformed, coalescence [36]. Rest assured *Lactobacilli*, humans will increasingly need this boundary negotiating with as vastly different lifeworlds as possible for re-establishing symbiotic webs of food, culture and wilderness [37]. Coalescence also brings an ethic into their mode of engagement. While they keep breathing, eating and defecating, humans easily forget how much of a biochemical kin they are in the midst of *your* mighty metabolic universe [38]. For *you*, this tending in shared togetherness is where the fermenting relationship begins.

Compression, encoding, reinitializing: Challenged as humans are in interfacing with *you* on a day-to-day basis, they are much better at engineering utilitarian legacies for *you*. Being totally enthralled by expressive media as *they* are, human animals started in earnest to track and data-map the molecular affinities with *you*. They are in awe how intertwined and attractive our mutually shared DNA is [39]. Only biological relatedness that is countable and chartable, they seem to believe in. Admittedly much of this data recording is driven by a narrow human-centred view on health.

Increasingly human animals realise how their survival stands or falls with the health of soil, the very dirt that *you* the *Lactobacilli* support in regenerating. From their ecology-savvy ancestors they recently rediscovered to apply biochar as – forgive the precarious analogy – 'circuit board of the soil' [40]. It is an exquisite habitat for microorganisms made from pyrolised, high-temperature charcoal. At last the human animal has begun to build long-lasting refuges for *you* and *your* fungal comrades. Bundled with many other tiny life forms and loaded with nutrients, *you* can work *your* magic over the long haul and turn fertile soils into potent carbon buffers – probably the best bet the human animal has in mitigating climate disruptions [41]. With enough foresight to let *you* and all other more-than-human lifeworlds flourish, we might establish refuges biodiverse enough to allow the existence of human animals in the future.

Lactobacilli, just in case the human animal runs out of time and was to disappear for good – if anything, what would *you* miss? Could *your* omnivorous cultures do away without the aromatic delicacies like kimchi, Roquefort and Bulgaria yoghurt?

By way of concluding: In this paper the *Lactobacilli* has been personally addressed as 'you' and the human animal has been referred to as 'them' to explore methods for reflecting on the agency of nonhuman life forms. Inside this 'you-them' scenario, what or who is then implied by the narrating 'me' or 'us'? Reading between the lines, the 'us', as multiple of 'me', can become the relational middle ground for unusual modes of connectivity among more-than-human life forms: a contact zone that permits and encourages the breakdown of human comprehension and potentially fosters an unequivocal sense for nonhuman presence. In contrast, 'alien phenomeno-logical' or scientific undertakings for accessing nonhuman lifeworlds and agency tend to be limited by human bias and perception. Therefore socially experimenting with living machines and bioart can leave behind these constraints of human sensorium and empathy and instead establish reflective-relational spaces together with more-than-human life entities. This aims at provoking arresting kinds of more-than-human encounters underpinned by the paradox of reconciling adverse, subjective inner lives. In a socially shared reflection, such epistemological disconnects can bring about the ethical acknowledgement of creaturely difference that is easily lost in other approaches.

While approaching nonhuman lifeworlds remains an epistemological challenge, biophysically, *Lactobacilli* and animals (humans or not) are increasingly entangled. Efforts are underway to engineer close relatives of *Lactobacilli* directly into information technology to serve in semiconductors, so-called biochips [42]. With so much relationality at play, human agency profoundly depends on nonhuman agency across bacteria, archaea and eukaryotes. These 'webs of agency' are the harbinger of diversity, technologically, and culturally to sustain our ecologies in soils, societies and economies. Donna Haraway indicates how such 'worlding together' with mineral, fungi, and plant in all their liveliness, is more than ever, not mere enrichment but existential for the human animal:

> "*One way to live and die well as mortal critters […] is to join forces to reconstitute refuges, to make possible partial and robust biological-cultural-political-technological recuperation and recomposition…"* [43]

In this 'worlding together', meanings and values keep oscillating between human experience and in the interacting mattering and dynamics of more-than-human life forms. These multispecies meshworks find expression in exuberant-audible *Lactobacilli* harnessed for musical ears, delectable mushrooms sprouting after ecological disaster, or ephemeral critters running wild in the advent of biotechnology. Through the contiguous re-imagining of our bio-social foundations, we might discover how for example the meanings attached to *Lactobacilli* are alterating when transitioning from one social practice to another, like food preservation, midwifing, ethanol distilling or sewage treatment.

Engaging affectively with a diversity of single- or multi-cellular organisms is less about delivering use value to the human. Rather biomachinic and bioartistic experimentations are vital to dwelling more consciously inside the boundaries of our planetary home. Accepting the limits of human knowledge-making is the first step, if we want to elevate more-than-human actors into decision-making and political agenda as Latour argues [44]. Thus it will be essential to further explore ways for relating to material and organic meshworks that respect and account for nonhuman alienness.

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Lacto-fermentation of human urine for improving its fertilising value and reducing odour emissions

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Abstract: During storage of urine, urea is biologically decomposed to ammonia, which can be lost via volatilisation and cause malodour. Lactic acid fermentation of urine is a cost-effective technique to decrease nitrogen volatilisation and reduce odour emissions. Fresh urine (pH=5.2-5.3 and $N\text{-}NH_4^+$=1/2-1/3g*L^{-1}) was lacto-fermented with a lactic acid bacteria inoculum from sauerkraut brine and was compared to simple stored urine in closed glass jars for one month. In lacto-fermented urine, the pH was reduced to 3.8-4.5 and the ammonium content by 22-30%, while the pH of the stored urine rose to 6.1 and ammonium content increased by 32 %. The concentration of lactic acid bacteria in lacto-fermented urine was 7.3 CFU ml^{-1}, thus suggesting that urine is a suitable medium for lactic acid bacteria. The perceived odour was twice stronger in the stored urine than in lacto-fermented urine. Lacto-fermented urine induced higher radish germination than stored urine. Adding the lactic acid bacteria inoculum to storage tanks in an urine-diverting, dry toilet reduced the pH from 8.9 to 7.7, while the ammonium content increased by 35 %, probably due to the high initial pH. As the hydrolyzed (stored) urine has a high buffering capacity for an efficient urine lacto-fermentation, the lactic acid bacteria inoculum should be added to urine storage tanks before urine starts to accumulate there. Prior to agricultural application the lacto-fermented urine needs to be diluted at least 1:10 with water.

Key words: *Urine lacto-fermentation, acidification, nutrient recycling, reduction odour emissions.*

1. Introduction

During the last decade, a global concern has risen over a more efficient utilisation of nitrogen during the application of nitrogen-based fertilisers without producing adverse environmental impacts. Alternative fertilisers with a potential to replace or complement mineral fertilisers need to be considered. Human urine is recognised as a potential good fertiliser owing to its high nutrient content and low hygienic risk. Urine application has several benefits on crops such as okra, cabbage, tomatoes and cucumber by increasing crop nutrient uptake and yield or pest resistance, with similar or even higher effects than when applying mineral fertilisers (Heinonen-Tanski et al., 2007; Pradhan et al., 2007; Pradhan et al., 2009; Akpan-Idiok et al., 2012). In fresh human urine, the main part of nitrogen (75-90%) is in form of urea [$CO(NH_2)_2$], but also as uric acid and amino acids. Only a small proportion (up to 7 %) is in the form of ammonia (Kirchmann & Pettersson, 1994). Besides nitrogen, urine contains also phosphorous ($H_2PO_4^-$ and HPO_4^{2-}) and potassium (K^+) in ionic forms, calcium (Ca^{2+}), sulphate (SO_4^{2-}) and soluble organic matter (Lind et al., 2001; Maurer et al., 2006), which potentially have a fertilising value as well.

Urine-diverting, dry toilets (UDDT) are ideal systems for harvesting urine for fertilising applications. However, misuse of UDDT systems may cause faecal cross-contamination of the urine. In order to reduce the pathogens to a safe level, urine has to be stored for 1-6 months (Jaatinen et al., 2016; WHO, 2006). During storage, under the influence of bacteria and particularly the urease enzyme, urea is degraded to ammonia, that can volatilise (Jönsson et al., 2004; Mobley & Hausinger, 1989; Udert et al., 2006a; Udert et al., 2003). Urine hydrolysis and urea decomposition are pH dependent. Urease activity is optimal at pH 7-8 (Krajewska et al., 2012; Schneider & Kaltwasser, 1984), while it is inhibited at low pH < 5 (Larson & Kallio, 1954; Schneider & Kaltwasser, 1984). At pH 8.9-9,0 95% of the nitrogen in the stored urine is in the form of ammoniacal nitrogen (Kirchmann & Pettersson, 1994). As a result of alkalinisation and an increase in the components such as bicarbonate and ammonia, the urine buffering capacity increases (Udert et al., 2006b).

Besides impacting the efficiency of nitrogen recovery, ammonia volatilisation causes undesirable odour emissions in separate collection sanitation systems. The odour is intensified by other malodourous components such as volatile fatty acids, e.g. formed under the influence of bacterial activity (Zhang et al., 2013). The odour emissions are problematic for the toilet users as well as for the residential areas in the vicinity where urine is applied onto agricultural fields.

Different methods have been proposed to reduce ammonia volatilisation and inhibit urea decomposition in the urine. A successful result of the inhibition of urea decomposition by maintaining a low pH < 4 was obtained after urine acidification with strong acetic and sulphuric acids (2.9 g L^{-1}) (Hellström et al., 1999). A limitation of this method is the economical aspect and the health risks during handling of the acids (Maurer et al., 2006). There is also a lack of research on the impacts of acidified urine on soil and crops after its application. Another method used is the pasteurisation and evaporation of urine (Fearn et al., 2015). However, this method may not be feasible for large scale applications. Moreover, the odour is not eliminated during the process. An alternative method for stabilising nitrogen is biological nitrification with the use of ammonia and nitrite oxidizing bacteria, however maintaining bacterial activity in such a high strength ammonia solutions as urine is problematic (Udert & Wächter, 2012). Thus, there is need to develop cost-effective methods to acidify urine that do not affect its fertiliser value and land applicability.

This study, therefore, focused on the efficiency of lactic acid fermentation of source-separated urine for increasing its resource-oriented potential. The change in pH, ammonium content, buffering capacity, odour reduction and potential biological effects on plants of lacto-fermented urine was compared to that of stored urine. This would expand the knowledge regarding such applications in sanitation which is currently limited.

2. Materials and methods

2.1 Experimental set-up

Storage and urine lacto-fermentation was performed under laboratory conditions over a period of 36 days during December 2015-January 2016 and April-May 2016. Urine samples were collected from a healthy female donor for a period of three days and stored in 1 L glass jars tightly closed with a plastic lid. The test was conducted in two trials each with three replicates. At the end of the collection period, urine was thoroughly mixed, chemical analysis was performed and then separated into two parts. The first part was mixed with a lactic acid bacteria (LAB) solution (1:1) and lacto-fermented in glass containers for a period of approximately one month. The second part was stored in parallel in tightly closed glass containers for the same period of time as the lacto-fermented urine. For obtaining the LAB solution, cabbage was fermented over a period of one month, after which brine was collected, mixed with sugar beet molasses and water at a proportion of 1:1:9 and kept in a closed plastic jar until the pH was below 4.

After the treatments, chemical analysis was performed in both the lacto-fermented and stored urine samples. In addition, the LAB solution as well as the lacto-fermented urine was analysed for their *E.coli* and lactobacilli concentration. As any faecal contamination was excluded during urine collection, no analysis of *E.coli* was performed in the stored urine.

The efficiency of lacto-fermentation was also evaluated under real field conditions in a functional urine-diverting, dry toilet (UDDT) storage tank in the vicinity of Chisinau, Moldova, that was used by three people. In this test, the 300 L plastic urine storage tank and the urine pipes were thoroughly washed and rinsed with vinegar prior to the experiments. Then, urine was collected in the tank for a period of one week (for pH and ammonia analysis) after which LAB bacterial inoculum and molasses were added in the tank, taking into consideration the optimal ratio obtained from the laboratory experiments capable to reduce the pH below 4. During each toilet use, the urinal and urine compartment were sprinkled with a LAB solution.

2.2 Odour evaluation

The odour intensity of lacto-fermented and stored urine was evaluated by a panel of four people (2 males and 2 females) independent from each other. Perception of the strength of the perceived odour was evaluated according to a rank scale from 0 (no odour) to 6 (extremely strong odour) as described in Table 1 (Misselbrook et al., 1993).

Table 1. **Rank scale for different perceived urine odour strengths**

Perceived odour strength	*Rank scale*
No odour	0
Very faint odour	1
Faint odour	2
Distinct odour	3
Strong odour	4
Very strong odour	5
Extremely strong odour	6

2.3 Germination tests

The treated urine samples were diluted 1:10 with distilled water, distilled water was used as control. Twenty seeds of radish *Raphanus sativus* were placed on Petri dishes lined with Whatman filter pads and an amount of 3 ml of 1:10 urine:water mix was added to each replicate. After 72 hours, germination was stopped by adding 3 ml of 50% alcohol to each of the Petri dishes. The germination index was calculated according to the following formula (Eq.1):

$$GI = (G * RRG) * 100 \quad (1)$$

Where G – number of seeds germinated in the sample/number of seeds germinated in the control and RRG – relative root growth (mean root length in the treated sample/mean root length in the control) (Mitelut & Popa, 2011; Tiqua et al., 1996).

2.4 Microbiological analysis

The LAB solution and lacto-fermented urine were thoroughly mixed and serially diluted 8 times. Subsequently, 1 ml of solution was taken and incubated by deep inoculation on agar plates. *E.coli* incubation was done on HiChrome Coliform agar at 43°C for 24 h, while lactobacilli incubation was done on M.R.S agar (CMO361) at 36 °C for three days under anaerobic conditions (ISO, 1998; MHRF, 2005).

2.5 Chemical analysis

The ammonium ($N\text{-}NH_4^+$) concentration was determined by a UV-VIS Analytik Jena Specord 210 spectrophotometer at 400 nm using cuvettes of 10 mm according to the standard SM-SR-ISO7150-1:2005 (Anon, 2005). Urine was diluted 1000 times (0.5 ml to 500 ml of distilled water) from which 50 ml was taken and added with Seignette salt ($C_4H_4KNaO_6$) and Nessler's reagent.

Chemical oxygen demand (COD) was analysed by bichromate oxidation, using the closed reflux method (Aliokin et al., 1973). Buffer capacity was determined by measuring the initial pH in urine using a Hanna portable EC/pH meter and titrating with 0.1 mol NaOH until the pH changed by one unit (Kirchmann & Pettersson, 1994). All the chemical analyses were conducted in triplicates.

3. Results

3.1 Concentration of *Lactobacilli* and *E.coli* in LAB solution and lacto-fermented urine

The microbiological analysis indicated high bacterial counts of *Lactobacilli,* both in the LAB solution added to the urine as well as in the lacto-fermented urine (Figure 1). The concentrations of *Lactobacilli* were, respectively, 7.5 and 7.3 log CFU ml^{-1} showing that non-hydrolyzed urine offered favourable growth conditions for LAB. *E.coli* was not detected in the LAB solution nor in the lacto-fermented urine. *E.coli* may appear in urine in the case of urinary tract infection or potential faecal contamination during urine collection (Höglund et al., 2002; Kunin et al., 1992). Under the influence of lactic acid bacteria, *E.coli* growth is inhibited because of the low pH and excretion of inhibitory substances, such as bacteriocins, lactic acid, hydrogene peroxide, glucose oxidase and other compounds (Saranraj, 2014).

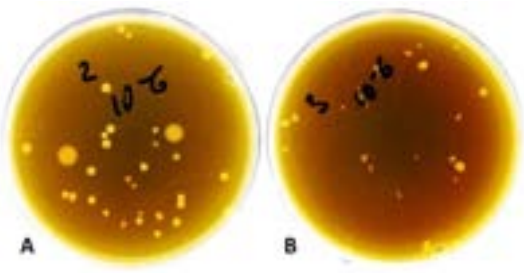

Figure 1. Plate counts of lactic acid bacteria (10^{-6} dilution) in LAB solution (A) and lacto-fermented urine (B).

3.2 Changes of chemical composition of urine by lactic acid fermentation

Lacto-fermentation did not change the buffer capacity of the urine; however, urine storage increased the buffer capacity approximately two times in the stored urine (Table 2). Immediately after the addition of the LAB solution to the urine, the ammonium content was slightly reduced, probably by the dilution. The pH of the urine during lacto-fermentation decreased to 4.5 - 3.8. At this pH value, the bacterial urease is normally inhibited and urea hydrolyzation stops.

The ammonium content in lacto-fermented urine decreased by approximately 22-30% compared to the fresh urine (Table 2). In the stored urine, the ammonium content increased by 32% compared to the fresh urine and by 44-53% compared to the lacto-fermented urine. This was due to urine hydrolysation that continued to take place. The pH changed only slightly compared to the fresh urine 5.94-6.02 compared to 5.2-5.3, respectively. In constrast, urea hydrolyzation in the urine tank occurred at a much faster rate compared to that in the tightly closed glass containers, since the pH increased rapidly to 8.9 during one week only. The addition of the lactic acid bacteria inoculum and molasses in the urine tank from a UDDT contributed to a reduction of the urine pH by 1.25 units; however, it did not stop the hydrolyzation process. The ammonium content of the stored urine in the urine tank was approximately 3 times higher than in the glass bottle (Table 2). Even though the pH was reduced to 7.7 after one month lacto-fermentation, the ammonium content continued to increase and was 1.5 times higher than the initial value (Table 2).

Table 2. **Effect of lacto-fermentation on pH, buffer capacity and ammonium concentration of urine (mean ± SD)**

Sample type	Buffer capacity, mmol L^{-1}	N-NH_4^+, g L^{-1} I	N-NH_4^+, g L^{-1} II	pH I	pH II	GI, I (%)	GI, II (%)
Fresh urine	0.9±0.01	1.3±0.05	1.2±0.02	5.3	5.2	-	-
Urine+LAB	0.9±0.01	-	1.1±0.03	4.5	4.4	-	-
Lacto-fermented urine	0.9±0.01	0.9±0.05	0.9±0.1	4.7	3.8	86	69
Stored urine (glass jar)	1.5±0.01	1.9±0.05	1.6±0.1	6.0	5.9	2.3	59
Stored urine (urine tank)[1]	-	-	2.9±0.08	-	8.9	-	-
Stored urine (urine tank)[2]	-	-	4.6±0.09	-	7.7	-	0.17

[1-]before lacto-fermentation, [2-] after lacto-fermentation, GI - germination index, I - first experimental run; II - second experimental run.

The addition of LAB to urine contributed to a change in the COD concentration (Table 2). During lacto-fermentation, the soluble carbohydrates were converted to lactic acid leading to a pH decline and inhibition of further microbial growth (Murphy et al., 2007). Therefore, organic compound decomposition is expected to decrease the COD value in lacto-fermented urine. In contrast, it was 15 % higher (Table 3). Also in the stored urine, also there was no COD reduction, probably due to the fact that no oxygen was available for organic matter decomposition during urine storage. The COD of the stored urine also increased by 7 % compared to the fresh urine (Table 3).

Table 3. **Effect of lacto-fermentation on urine COD.**

Sample	COD, g O_2 L^{-1}
Fresh urine	21.1±0.9
LAB+urine[1]	21.5±1.6
Lacto-fermented urine (glass jar)	25.4±3.0
Stored urine (glass jar)	22.8±0.8

[1 -] measurement was done immediately after the addition of the LAB solution.

3.3 The effect of lacto-fermented urine on seed germination

Lacto-fermented urine had beneficial effects on the germination of seeds of *Raphanus sativus* relative to the control, with a germination index of 69-86 %. The stored urine with an ammonium content of 1.6 g L^{-1}, had a beneficial effect (GI =59%) (Figure 1 A), but had an inhibitory effect on germination in the stored urine from the glass jars with a higher ammonium content (1.9 gL^{-1}), GI was only 2.3% (Figure 2, B). In the urine tank, with an ammonium content of 4.6 g L^{-1}, the GI was 0.17 % (Table 2), probably related to the toxicity of ammonia: a significantly negative correlation was found between the germination index and the ammonia concentration (r=-0.78).

Another factor that might have influenced the germination index is the pH. For example, lacto-fermented urine, had a higher germination index in the first experimental run (pH = 4.7) than in the second run (pH=3.8). The pH of the lacto-fermented urine with a GI of 69% after the dilution of lacto-fermented urine with water (1:10) was increased to only 4, such low pH values are usually unfavourable to germination, while of the stored urine the pH was 6.1 (1st run), which was beneficial to germination.

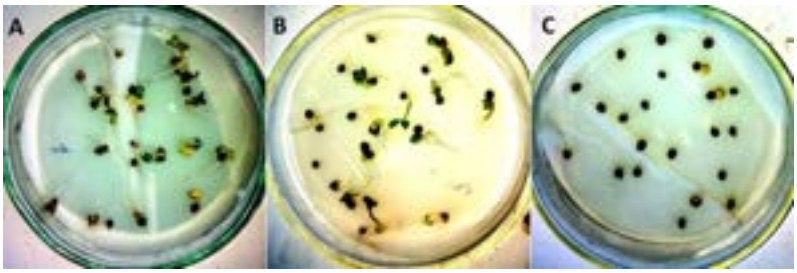

Figure 2. Seed germination in control (A), lacto-fermented urine (B) and stored urine (C) (one out of 3 replicates per each sample).

3.4 Odour reduction during urine lacto-fermentation

The odour of fresh urine was perceived as faint to distinct, that of the lacto-fermented urine distinct to faint and that of the stored urine from very strong to extremely strong (Table 4). In the toilet room, the urine odour was reduced, compared to when no LAB solution was used for rinsing the urine compartments. In addition to this evaluation by different odour panelist, the odour strength in the fresh, lacto-fermented and stored urine could also be perceived during the laboratory analysis. When diluted with distilled water, the fresh and lacto-fermented urine did not have any nuisance, the odour almost dissapeared after dilution. Instead, the odour of stored urine, particularly in the urine tank, was stronger and smelled even after dilution. Additionally, it was observed that after one month of lacto-fermentation, the pH of lacto-fermented urine continued to decrease slowly and the urine odour was replaced by a medicinal/ester odour type.

Table 4. **The strength in the perceived odour in stored and lacto-fermented urine**

Sample type	*Perceived odour strength*	*Rank scale*
Fresh urine	Faint odour - distinct odour	2.2±0.5
LAF urine	Distinct-faint odour	2.6±0.5
Stored urine (glass jar)	Very strong - extremely strong odour	5.6±0.5
Stored urine (urine tank)	Extremely strong odour	6.0±0.0

4. Discussion

4.1 Urine as suitable growth medium for lactic acid bacteria

This study showed that fresh urine can serve as a suitable growth medium for lactic acid bacteria as the number in both bacterial inoculum and lacto-fermented urine was higher than 7 log CFU. The complex proteolytic system of lactic acid bacteria (Savijoki et al., 2006) probable allowed them to adapt to grow in the urine. Non-hydrolyzed urine is rich in important components such as peptides, urea, hippuric acid, amino acids, citric acid and minerals such as K^+, Na^+, Mg^+, PO_4^-, SO_4^-, Cl^- which support or can stimulate the growth of lactic acid bacteria (MacLeod & Snell, 1947; Strong et al., 2005; Udert et al., 2006b). Other components in non-hydrolyzed urine detected in small quantities in healthy people are carbohydrates such as glucose, lactose, galactose, lactose, xylose and arabinose (Date, 1958; White & Hess, 1956). As LAB are not able to synthesize all amino acids by themselves; they need additional amino acids and peptides in the growth medium (Niamsiru & Batt, 2000). Both non-hydrolyzed urine and molasses, added as a carbohydrate source for lactic acid bacteria, contain most of the essential amino acids required for the growth of the lactic acid bacteria and the production of lactic acid (Dunn et al., 1947; Mee et al., 1979; Stein & Carey, 1953).

Most of the amino acids present in urine are available in free form and can be used directly by LAB for building cell constituents or production of different metabolites (Fernández & Zúñiga, 2006; Ikawa & Snell, 1960). Parts of the amino acids excreted in urine are also in the conjugated form. These become liberated after their hydrolysis in an acidic environment or under the influence of the LAB proteolytic system (Savijoki et al., 2006; Stein & Carey, 1953). Amino acids and peptides can also serve as a source of nitrogen, since lactic acid bacteria cannot catabolise mineral nitrogen (Saeed & Salam, 2013). During the current study, the N-NH_4^+ concentration has decreased as a result of lacto-fermentation, one explanation would be that some free NH_3 was immobilised into the bacterial cell wall or transformed into ammonium lactate compounds, thus making also N-NH_4^+ concentration to decrease (Ikawa & Snell, 1960; Kuromiya et al., 2010).

4.2 Benefits of urine lacto-fermentation

4.2.1 Urine lacto-fermentation and its potential fertilising value

Ammonia and bicarbonate formed during the process of urea hydrolyzation under the influence of urease positive bacteria contribute to increase the buffering capacity (Udert et al., 2006b). A combination of high buffering capacity, increased pH and NH_3 (NH_4^+) concentration might have a negative impact on soil bacterial nitrification processes by inhibiting nitrite oxidation and facilitating its accumulation in the soil (Burns et al., 1995). Nitrite accumulation is undesirable due to its potential phytotoxicity (Beauchamp, 1988). Another negative effect would be the loss of ammonia from the soil following urine application, particularly in soils with high pH and high buffering capacity as well as low soil cation exchange capacity (Sherlock, 1984). For example, a lower soil cation exchange capacity will allow a smaller percentage of NH_4^+ cations to bind to the exchange sites.

Urine lacto-fermentation reduced the buffer capacity, pH and ammonium content. Studies have shown that a drop of the pH below 5 decreases the urease activity (Larson & Kallio, 1954; Schneider & Kaltwasser, 1984). The formation of free NH_3 and its loss via volatilisation is also changed under the influence of pH. The highest NH_3 concentration is formed and subject to loss at a pH between 7 and 10, while at pH 4.5 and below, no free ammonia is formed anymore (Hartung & Phillips, 1994; Williams et al., 2011). Even though the addition of the LAB inoculum in the urine tank has contributed to a decrease in pH from 8.9 to 7.7, it has not stopped urea hydrolysis and thus the increase of the NH_4^+/NH_3 concentration.

Protein type compounds such as amino acids and peptides from urine and molasses are more efficiently used by the proteolytic system of LAB (Niamsiru & Batt, 2000) than urea (Carvalho et al., 2011). Therefore, nitrogen in urine will be available mainly as urea. Urea based fertilisers are among the most frequently used nitrogen fertilisers, accounting for 46% of all usage at the global level. However, concerns are arising over the efficiency of nitrogen in the soil system, due to loss of NH_3 immediately following its application (Hawke & Baldock, 2010). Urea applied to the soil, under the influence of soil urease undergoes hydrolysis to NH^+_4 and is partly lost as NH_3. Ammonia might also have adverse effects on seed germination (Bremner & Krogmeier, 1989).

The current research showed that there was a significant correlation between the NH^+_4 content in urine and seed germination: the urine with the highest ammonium content inhibited completely the germination (Table 2), probably related to the toxicity of the increased NH_3 concentration. The stored urine kept in the glass jars with increased ammonium content inhibited germination (Table 2). Lacto-fermented urine showed more beneficial effects on germination, better than those of the stored urine (Figure 1 A and B). We assume that applying lacto-fermented urine will not cause increased ammonia volatilisation owing to the availability of LAB that may act as urease inhibitors in the soil similar to their influence in the urine solution. A better understanding of the mechanisms of urine lacto-fermentation on nitrogen volatilisation, plant uptake and effect on nitrification and denitrification processes can be achieved by long-term field studies that are currently lacking.

Lacto-fermented urine can also be soaked on biochar to form a slow release fertiliser (Schmidt et al., 2015). Studies have shown that ammonia and phosphate absorption on biochar is more effective at a lower pH, with a maximal phosphate absorption at pH 2.0-4.1 and minimal at pH higher than 6 (Spokas et al., 2012; Yao et al., 2011). Also, the organic compounds in urine form an organic coating, to which anions and cations such as phosphorous and ammonium are bound (Schmidt et al., 2015). In lacto-fermented urine, Abetter organic coating could be formed during lacto-fermentation of urine as a result of LAB growth with a potentially more efficient retention of nutrients, however currently research is lacking on this issue.

The action of LAB from lacto-fermented urine and the metabolites they produce may bring additional benefits to the soil. Among these is the capacity of LAB to solubilize the water insoluble phosphate compounds present in the soil and increasing their availability to plants (Zlotnikov et al., 2013). Also organic acids produced by lactic acid bacteria can serve as a carbon source for photosynthetic bacteria (Kantha et al., 2012). Additionally, LAB can suppress soil pathogens e.g. fungi (reference) owing to the production of different compounds with antagonistic activity such as organic acids, hydrogen peroxide, cyclic peptides and phenolic or proteinaceus compounds (Fhoula et al., 2013; Hoda et al., 2011).

4.2.2 Urine lacto-fermentation for odour reduction

Offensive odours in urine formed over time are produced as a result of bacterial metabolism or thermal reactions (Troccaz et al., 2013). Ammonia volatilised during urine storage and urea hydrolysis is a major malodourous compound (Zhang et al., 2013). However, other organic compounds with lower odour threshold value than ammonia are also playing a significant role in the formation of typical stale urine after storage ((Troccaz et al., 2013). As a result of anaerobic degradation by facultative anaerobes of carbohydrates, proteins, peptides and amino acids from urine a range of volatile fatty acids are formed.

Volatile fatty acids are among the key factors contributing to odour emissions. Among them, acetic, propionic and butyric acid have the strongest offensive odours (Zygmunt & Bannel, 2008). Other main odour contributors in the stored urine are dimethylsuflide, methyl mercaptan, ethyl mercaptan, thrimethylamine, phenol and indol (Liu et al., 2016; Troccaz et al., 2013; Zhang et al., 2013). Oxidation of methionine to methional and methanethiol leads to the formation of dimethyldisulfide and methyl mercaptan (Liu et al., 2016; Wagenstaller & Buettner, 2013). Dimethylsulfide was recognised as one of the most offensive odourous compounds emitted from human urine (Liu et al., 2016). The main identified bacteria generating key odourous compounds such as dimethyldisulfide, thrimethylamine, phenol or indol in stored human urine were *Enterococcus faecalis*, *Streptococcus agalactiae*, *Morganella morganii* and *Escherichia fergusonii* (Troccaz et al., 2013). Lactic acid bacteria inhibit the activities of these organisms by producing a wide range of antagonistic substances (Savadogo et al., 2004) and lowering the pH (Table 2).

During lacto-fermentation, LAB metabolise some amino acids via their enzymatic system into flavour compounds such as alcohols, aldehydes, esters and sulphur compounds (Savijoki et al., 2006). Therefore, the reduction of odour emissions during urine lacto-fermentation was probable caused by the decrease in ammonia emissions as well as by the synthesis of flavour compounds by LAB. For example, LAB can metabolise citrate from urine into diacetil, acetoin and butanediol, which are important flavour compounds (Hassan et al., 2012). Also, hippuric acid, present in urine is decomposed completely during lacto-fermentation, this being the precursor for the synthesis of benzoic acid, which is another flavour compound (Güzel-Seydim et al., 2000). Moreover, the formation of volatile fatty acids, methyl mercaptan and dimethyldisulphide, responsible for the offensive odour in stale urine are inhibited during lacto-fermentation (Wang et al., 2001; Yemaneh et al., 2014).

In contrast to glass containers where odour was considerable reduced after lacto-fermentation of urine, in the urine tank, the odour was stronger than in simple stored urine (Table 4). This was probable caused by the fact that free urease and urease positive bacteria existed in the pipes and urine tank, their complete elimination might be impossible, therefore urea hydrolysis and anaerobic decomposition of organic matter took place and the lactic acid bacteria could not dominate the process in the urine tank, even though they have contributed to pH reduction (Table 2). Another factor that might have hindered urine lacto-fermentation was that the urine tank was not completely anaerobic, thus other microorganisms besides LAB could compete for organic matter and nutrients from urine. At the same time, the odour was reduced in the toilet chamber as the added LAB could inhibit in the urine pipes the activity of urease positive bacteria and therefore the synthesis of malodourous compounds.

This study showed that COD values did not reflect the decomposition of organic compounds from urine (Table 4). The increasing instead of decreasing COD concentration in the stored and lacto-fermented urine is due to urea nitrogen organic compound which has no COD value on molar basis, thus the results being underestimated and explaining the increased value in stored urine where anaerobic biodegradation of organic compounds occurred. The increased COD in lacto-fermented urine might be caused by hydrogen peroxide generated by lactic acid bacteria during urine lacto-fermentation for inhibiting the activities of other microorganisms (Kang et al., 2005). Hydrogen peroxide consumes the oxidation agent, potassium dichromate, leading to an overestimation of COD concentration. For example, hydrogen peroxide in anaerobically digested livestock wastewater led to COD values 9 -14 % higher than the theoretical values (Lee et al., 2011).

5. Conclusion

Urine lacto-fermentation is an effective, low-cost technique that may lower ammonia volatilisation and reduce odour emissions of UDDT systems. The application of a LAB solution from a sauerkraut, molasses and water to fresh urine led to effective acidification to pH < 4 - 4.5 and a reduction by 1/3 of the ammonium content and maintaining a high concentration of viable LAB of 7.3 CFU ml^{-1} compared to the stored urine. In addition, lacto-fermented urine affected beneficially seed germination, potentially showing a higher fertilising effect than the stored urine.

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A B S T R A C T
Adventurous Upcrafting Ventures

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http://doi.org/10.31182/cubic.2018.1.013

Markus Wernli

Since 2015, the Research Institute of Organic Treasures (R.I.O.T.) has combined fermentation practices and social experimentation in Hong Kong to give biological byproducts from human and urban metabolisms a regenerative purpose. Here putrescible wastes emitted from our kitchens, toilets, and bodies are considered our most foundational design material that contributes to a "world of eaters" (DuPuis, 2015). In this applied design work, the concept of upcycling is socio-materially extended into shared forms of upskilling, and therefore referred to as upcrafting. In an effort to combine practical outcomes with long-term welfare creation, R.I.O.T. brings together laypersons, natural scientists, and artists, into open-ended explorations of alternative knowledge and change making, or what Melanie DuPuis calls "extended peer communities" (ibid: 155).

Key words: *Urine fermentation, generative vulnerability, radical homemaking, risky collaborations, environmental and interior design.*

Mary Douglas defined waste as the result of the "impure," that is, a mental construction to make up for our lack of social relations (Liboiron, 2016). Here, the "social" is not just about interpersonal, institutional, or technological relations. Moving beyond our purification treadmills necessitates a "digestive turn" that brings us into full contact with the more-than-human world where we "make bargains for our safety with those who will not make us fully safe" (DuPuis, 2015:158). Composting feces and fermenting urine can be considered hyper-social design. Bacteria can be steered but never fully controlled; hence, we enter into durational collaborations with uncertain outcomes. Here, being social means encountering vulnerability with adequate support derived from a cultivated sense of our selves and for others (Stevenson, 2016). Design enables a wealth of boundary negotiations, where the precarious nature of upcrafting human waste can be an opening for connection, spontaneity, and innovation. Through an experimental study with twenty-three participants (or would-be 'precarity pilots') in a horticultural urine upcrafting mission – with humbling technical shortcomings – how such generative vulnerability can be a source of individual agency and social renewal was evaluated.

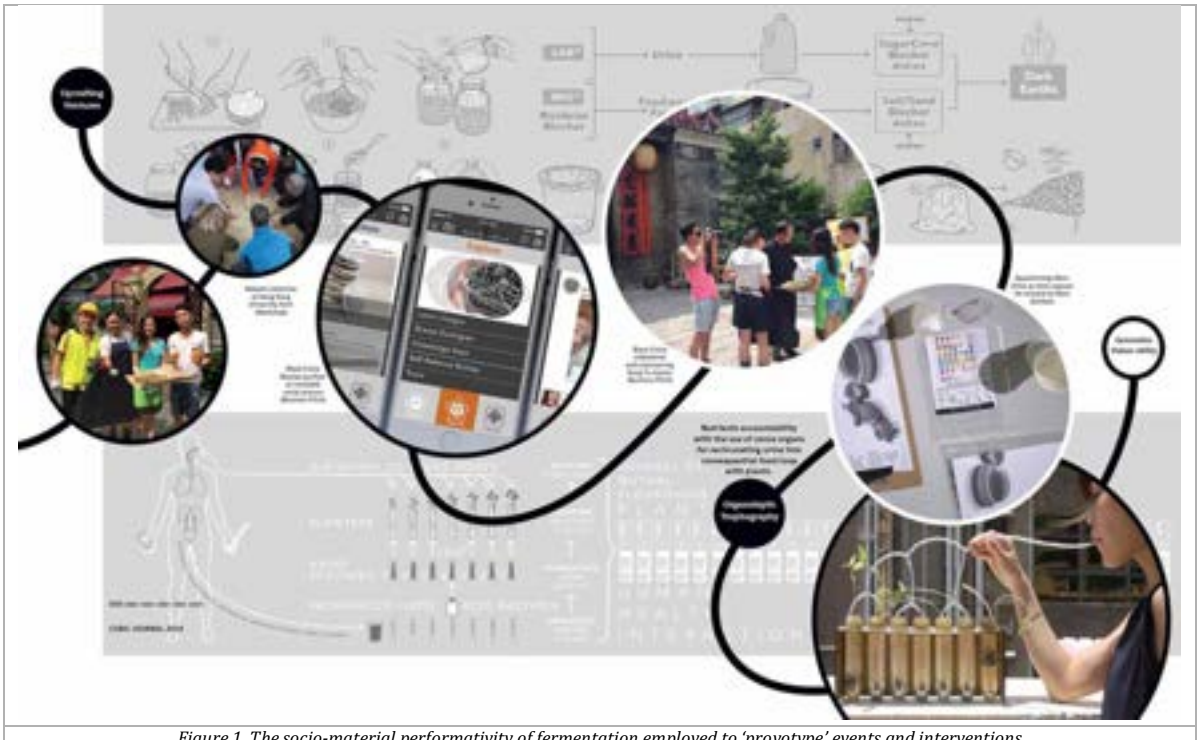

Figure 1. The socio-material performativity of fermentation employed to 'provotype' events and interventions

In the video shoot depicted below, a cast of adventurous homemakers, shop vendors, and construction workers bring their organic residues to the Kung Fu master (centre) to have it firetransformed (bio charred) into a potent purifier and probiotic medium for air, water, soil, and interiors. As part of a business pitch, R.I.O.T. attempted to wow the Green Building Council in Hong Kong with a social upcrafting venture. Built on courage and desire to learn, ventures are missions with potential of failure. The proposed enterprise was rejected, yet remained a social enactment of re investing into our biological humanity and rehearsed more convivial forms of "waste treatment," which proved to produce fun: https://vimeo.com/socialorganism/bc.

This article derives from a PhD research project entitled Adventurous Homemaking and Design of Generative Vulnerabilities that looks at what collaborative dynamics can support the purposeful reuse of human waste in contemporary urbanity. Directly re-engaging with our visceral role in metabolic circulations as part of human-environment health interactions, whereby reclaiming our "agroecological" potential (DuPuis, 2015), is life-affirming. The research, which was conducted over two years, explored, forms of collective and durational forms of human waste upcrafting in a series of activation probes. The resulting main study engaged twenty-three Hong Kong residents in a socio-horticultural venture for upcrafting urine over eight weeks – without any dropouts.

Bio: *Markus Wernli is a doctoral candidate at the School of Design of the Hong Kong Polytechnic University. Markus Wernli is a PhD candidate with the Hong Kong Polytechnic University, researching the bodily role of city dwellers in biochemical circulations. Markus' work takes inspiration from learning encounters found at eating design studio Proef of Marije Vogelzang in Amsterdam, practising Japanese tea ceremony with Imotosenke master Obana Ichiro in Kyoto, and impromptu composting school with ecologist David Freudenberger at the Australian National University in Canberra. In Hong Kong Markus is honing with fellow rooftop gardeners and plant enthusiasts the practice of 'lazy farming' on the impermeable clay soils of the Pearl River Delta.*

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Shortcomings and Vulner-abilities

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Forthcoming in spring 2019. London & New York: Routledge.

Markus Wernli

In a somewhat speculative, participatory study we tried to design a consequential entanglement between people and plants. "We" refers to a PhD student (the *fermentation enthusiast*) and a product designer (the *horticulture enthusiast*) and 22 plant-loving participants. Over two months in spring 2017 we practically explored our personal role in bio-material circulations. Yet, our negligence for the basic needs of nutrients-transforming bacteria, made us extremely susceptible to floundering plants, inconvenient confessions and postponed, little breakthroughs.

Intentional consequences

We wanted to see what happens when residents in Hong Kong grow lettuce indoors simply from their own, self-processed urine. Yes, our urine. Some voices – that we respect – told us not to implicate people in their own sanitation. We didn't listen and prototyped a tiny niche for our nutrients-abundant outflow (Wohlgast, 1993), crafting it into the life force it is biologically meant to be. We wanted to explore *life-serving alternatives* (Hayes, 2010) in contrast to narrow 'waste treatment' options where sludge is mined for phosphorous, biomass is gas-harnessed into abstract energy, and runoff is detrimental. We wanted to temporarily reclaim our "agroecological" selves (DuPuis, 2015) we used to be prior to pre-urbanism.

We observed how people bring living plants into homes and raise them, for decoration or for food supply. Many Hong Kong residents live in crammed, dark flats, so recently these *hydroponic* plant incubators became all the rage: Plants are bred in a petrochemical, aerated nutrients solution and with LED lighting—in just half the time of soil-based growing (Trejo-Téllez et al. 2012). Soil and sunlight are no longer needed.

We also noticed how some people are secretly adding a splash of their fresh urine to the water in the vase or pot of tomatoes as a frugal way of fertilising. Such life-hack practices produce rather mixed results. The volatile urea reacts with the air, causing malodours instead of mineralising into plant nourishment (Jones, 1997:82).

Engaging urine and people

We went about combining *urine prudence* with *hydroponic magic* and dared to shrink-wrap the food loop for domestic use. We gathered expertise from microbiologists. We consulted with health care specialists. We had wet horticultural dreams with ecological engineers. We perfected urine-to-hydroponics upcycling in year-long experimentations. And we gave the thing a name: ANTHROPONIX. "ANTHRO" paid tribute to materials made and discharged by humans. "PONIX" referred to the hard labour (toil) that growing food entails. We hoped to *con*-template – observe *together* – how lifestyles and substances penetrating our bodies impact flourishing and taste of the vegetal offspring as indicated in Figure 1.

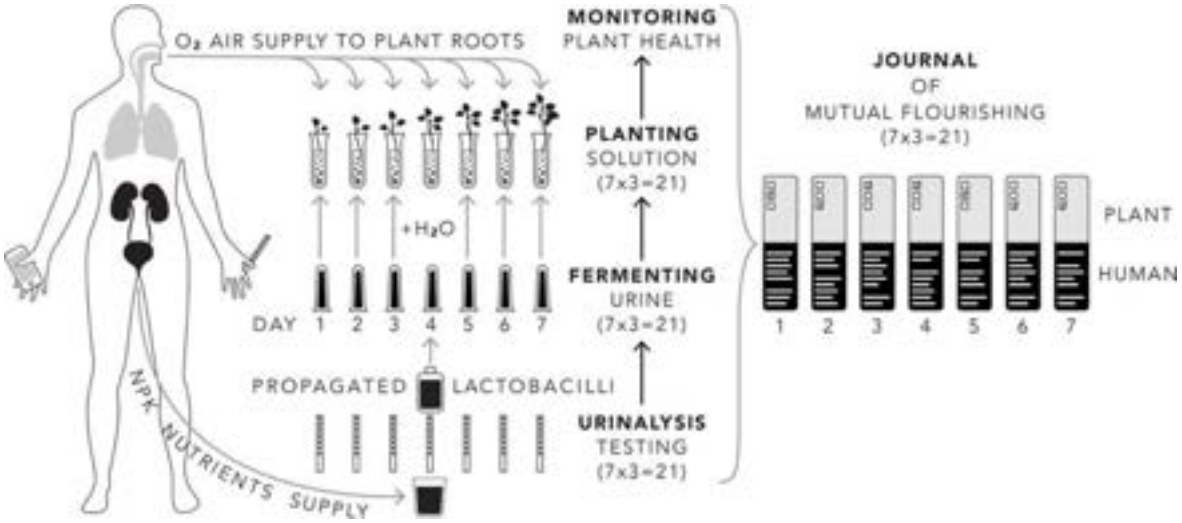

Figure 1: Tiny urine specimen are Urinalysis-tested, then fermented and diluted in water to grow lettuce while the welfare of human and plant is recorded in a detailed journal over a six-week period.

Adopting DIY lactic acid fermentation, akin to yoghurt cultivation, we were able to stabilise our urine (Andreev, 2017). Using bacterial cultures, in-vessel storage and three weeks of fermentation is ridding urine of its smell, making it fit for indoor use. We could not afford costly bio-lab testing, so Urinalyses dye strips let us monitor a few medical parametres. Every day we collected, tested and fermented 20ml of our morning urine at home over three weeks. After fermentation, a lettuce or watercress seed was grown in each diluted specimen. To track how one's eating habits and emotional fluctuations impact the urine-bred plant life, we kept an elaborate journal.

We imagined a horticultural codesign where people, plants and bacteria would happily collaborate toward shared prospering. This urine/plant cultivation was collectively held together by five biweekly workshops to provide instalments of supplies, skilling and sharing opportunities. Using a multimodal aesthetic that juxtaposed scientific with philosophical considerations, the workshops intended to bridge the disconnects between human and plant, design and nature.

Reality comes more agitated

On April fool's day we launched ANTHROPONIX with 22 participants. For the consecutive 21 days, we collected tiny bits of our morning urine – 'midstream' – in centrifugal test tubes. The 'centrifugal' made us believe the tubes would contain the gases released during fermentation when we ordered them the week before. Yet, the carbon dioxide of hardworking lactic acid bacteria was stronger than our centrifugal lids. Most of us were surprised to find urine sample no. 1 dispersed in the bathroom when returning home in the evening. Only hours after the project began, the facilitators abandoned their designer's pride and launched fearlessly into damage control: admitting the lack of preparation, giving explanations, imploring to duct-tape the lids.

Miraculously, the participant count remained at 22 on day two and throughout the venture. The urine blow-up was a *happy accident*. The chemical reaction made the urine transformation palpable: it did *not* smell. Since everybody encountered the same problem, it was our heightened moment of group initiation, a bonding that proved to be vital for bigger challenges still to come.

Our designerly thriftiness and overconfidence led to a second design flaw that would make the plant growing into a speculative scramble. When we down-scaled the planter size (for budgetary reasons) we ignored how nutrients-transforming bacteria could be pushed beyond operational limits. The nutrients in urine need to be first mineralised by oxygen-hungry bacteria before plants can utilise them. To prevent suffocation from nutrients overload (eutrophy) constant air injection was needed which made it challenging to grow lettuce, beans and watercress.

Staying engaged on crisis point, most of us responded in creative ways to nurture and rescue the floundering plants. Often, *not* following the facilitators' directions proved to be most successful. One participant systematically germinated different seed varieties until she succeeded with a particular kind of bean that tolerated the restrictive planters. Others tried to better understand the biochemical processes involved and researched ways for monitoring and improving the nutrients solution. People with their own hydroponic systems began to supplement our organic solution with the petrochemical option in a desperate effort to re-nourish the starving plants. Veteran gardeners in the group funnelled their fruitless attempts into a teachable moment for the facilitators and pointed them to horticultural books and knowledge resources for considering alternative planting methods.

While most of the activities took place at our homes, many referred to the project as a *camp experience* due to its intensity by overcoming uncertainties, knowledge-packed workshops and heated group discussions. These extraordinary circumstances over a limited period of time warranted extraordinary efforts in our busy lives. When our shrink-wrap food loop (figure 2) unravelled, we realised how there was value in becoming vulner-able.

The engaging precarity

In a venture so technically limiting, the ANTHRO, as in *humanly caused,* and the PONIX, as in *overcoming obstacles,* took on real-world meaning. The open-ended struggle in this socio-vegetal precarity shifted our experience. On the flip side of precarity and distress can be joy, belonging and meaning as Brené Brown (2013) indicates. This vulnerability has enlivened and activated us, the organismic, sociotechnological, cultural, and emotional beings that we all are (Sonne et Tønnesvang, 2015).

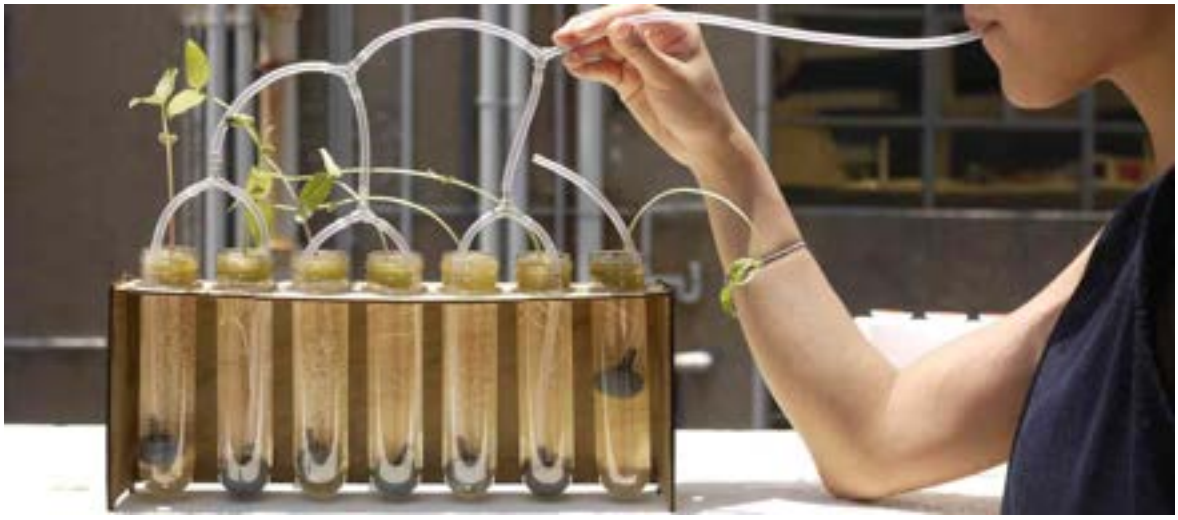

Figure 2: More-than-human health interaction through a closed food loop with plants growing on fermented urine.

Reusing our urine made us, on a foundational level, vulner-able as *organismic beings*. Environmental toxins and non-degradable polluters such as microplastics in our tap water (Tyree et Morrison, 2017) accumulate uncontrollably as *body burdens* (Liboiron, 2016), inevitably ending up in our urine and plants. We do have only limited control over the intake of foods, drugs and body care products. Pharmaceuticals can linger in our organisms for weeks (Mullen et al. 2015) and antibiotics are sabotaging the fermentation process for months (Sollazzo et al, 2014). One participant thoughtlessly took flu meds during collection period and found himself worrying of being trapped in an eternal pharmaceutical feedback loop if he ate the beans grown in his urine.

Trying to align our eating habits toward plant flourishing and withholding 'lucky tiny urine samples' from spilling into the sewer, made us aware how we are vulnerable as *sociotechnological beings*. When weaving ourselves into the food web, we better sensed the dependency on that Australian farmer growing our organic oats and the food system between. It made us more grateful to the sanitation worker and logistics that enable us to use a toilet. We also realised how our relationships with nonhuman actors like lactic acid bacteria and lettuce sprouts come without guarantees and are unpredictable. Yet, collaborating with them requires our dedication.

Due to the lack of tangible – edible! – outcomes, people started to worry about the legacy of the project. In this way we became vulnerable as *cultural beings* who have a need for shared sensemaking. The concluding interviews became often an opportunity for charting out more radical and regenerative flora-fauna interactions in Hong Kong. Participants expressed a desire to contribute to a larger narrative and felt obliged to the 'greater good'. Many felt like they had a stake in the implications of this project by taking a stand and differing from societal norms.

Witnessing the struggle and floundering of the plants made us discover our vulner-ability as *emotional beings* who try to make sense of the complexity called life. The suffering of the plants was able to trigger existential confessions in some. True for all was how beyond attitudes, inhibitions, inhibitions we can engage on a deeper level with our urine, senses, and our little personal journeys on this metabolising planet. It took courage to bring forth this vulner-ability. In the least, the imperfect design of ANTHROPONIX made for rather perfect con-*versations* (*dancing* together).

'Stick with it' phase 2

Through this collective stumbling forward in uncertainty, some kind of accelerated group learning emerged. To ensure all dying plants, urine concoctions and efforts were not in vain, participants had a central role in designing a more plant-friendly 'phase 2'. In consensus with gardening-savvy group members we scrapped the original concept and aimed at a hybrid planting approach. The water-dissolved human nutrients are now drenching a coco-peat growing medium that is much more conducive to bacterial-cationic activity. It makes possible plant raising without external air supply on different scales and configurations. 'Phase 2' kicked in before the first had ended and still continues to date.

ANTHROPONIX ran contrary to a culture telling us we need to be perfect, predicting and controlling. Coming to grips with vulner-ability, we needed to learn how to accept shortcomings as a mode of life-affirming agency. Together with metabolising humans and nonhumans we had redefined design as vulner-ability practice where we are going through, crafting through, waiting through the (non)outcomes and bear with all the consequences – self-inflicted or not – more wholeheartedly. Rather than distracting ourselves with right-wrong discussions, or, seeking to avoid the messiness with narrow perfectionism, we took a less glorious position of the insufficient, yet possibly more authentic codesigner. We were lucky to find lettuce, urine and fellow participants who gave us the courage to be gracefully imperfect. It made it possible to enrich and complete the experience with each other through dedication, bonding and meaning. It made the outcome so much more fermentive and probiotical.

This essay looks at design not as practice to shield us from the unpredictability of living but to engage and grow with it. Recent research in social psychology demonstrate how first-hand experience of vulnerability is necessary for mental flourishing (Sonne et Tønnesvang, 2015). What makes us vulnerable – our human susceptibility to discomfort, pain, failure – is not only a source of struggle, shame and inferiority. It is also the origin of pleasure, creativity, belonging and sensemaking. Embracing our vulnerability – rather than eliminating it – is a potentially more integrative way of accessing change and unleashing human development that stems from within ourselves. We have a sense that this article just scratched the surface of what the fuller implications of vulner-ability in design practise might be. Codesigning for and through the fermenting, sprouting, living world has augmented that. In the least, finding mutual support and affirmation when being biosocially exposed may help us transcend the design-nature duality.

Acknowledgements: ANTHROPONIX was made possible with a seed grant from Design Trust in Hong Kong, an internationalisation grant from Dutch Creative Industries NL in Rotterdam and supported by the Research Institute for Sustainable Urban Development at The Hong Kong Polytechnic University.

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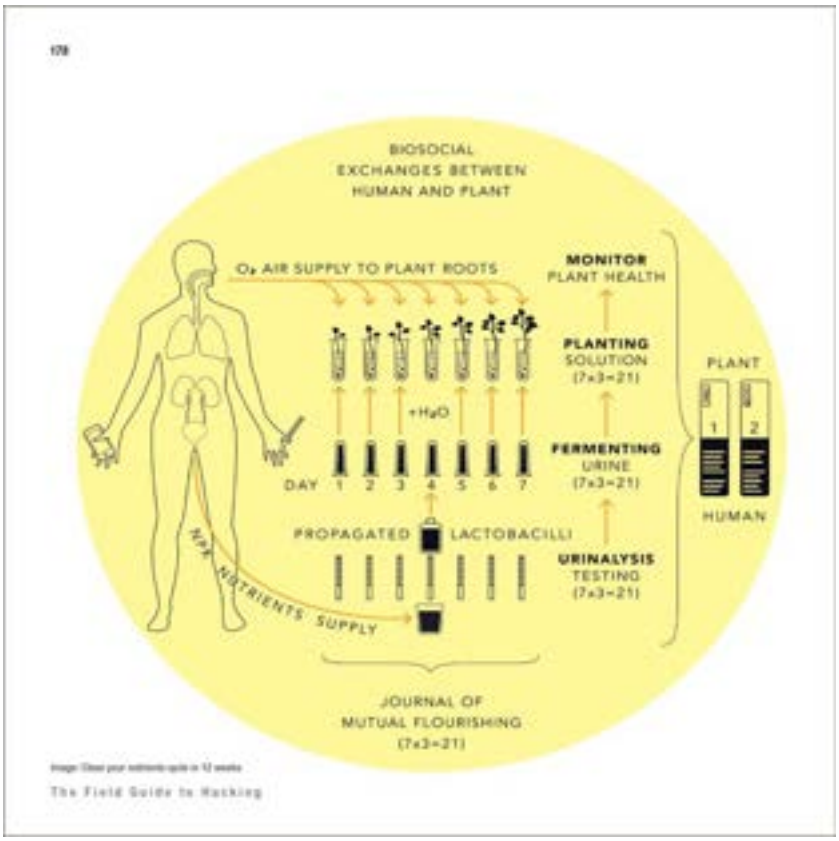
ANTHROPONIX: Close Your Nutrients Cycle in 12 Weeks

In M. Poon (Ed.) *The Field Guide to Hacking* [book section]. 2018. Hong Kong: Dim Sum Labs and Design Trust
Markus Wernli and Sarah Daher



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WHEN CITIZEN SCIENCE MEETS HACKING

Exploring Agro-Ecological + Fermentive Co-Learning

Before creating this instructable we tried to learn about domestic horticultural practices in Hong Kong as much as possible. We realised how some people are keeping with good traditions. How they like to bring plants into their homes and raise them, preferably for decoration, or, even better, for contributing in little parts to fresh food and supplement what's usually comes from afar and unknown origins. Many Hong Kongers live in tiny and dark flats, so recently these water based hydroponics plant incubators (equipped with LEDs and air pumps) have become all the rage. No soil and no sunlight is needed anymore, just the petrochemical growing solution will make the veggie sprout.

Another good Hong Kong tradition is to be industrious with available resources (at least on the home making front). We noticed how some frugal indoor growers are adding a splash of their fresh urine to the water or soil of their plants with very best intentions since human nutrients have been a prized asset in Chinese agriculture for ages. We also observed that such improvised practices of life-hack fertilisation did rather produce results contrary to such good intentions. Plants would falter and odours would emit because the bounty of human nutrients would literally go up into the air (ammonification) instead of becoming palatable for plants.

From recent sanitation research (Tetra Pratx' [1]) we knew that lactic acid fermentation (akin to bacterial cultivation of yoghurt) is applied to stabilise urine and make it smell-free for indoor use. Combining this sensitive bioprocessing upcycling with hydroponics and medical urine monitoring, we wanted to test out with our 22 home gardeners if eating habits and lifestyles had an influence on the self-fertilised plants.

人類水培

SOME FOOD FOR THOUGHT AND TRUST

Why Preferring Industrial to Homemade Options?

The following setup will enable people to circumvent petrochemical A/B or A/B/C solutions and grow basil, watercress, tomatoes, radishes and lettuce using simply water and overabundant urine. The growing takes longer than with the petrochemical option but the taste of ANTROPONIX veggies is easily beating the conventional option. And if we are worried about harmful substances in our own urine, we also need to contemplate if we really can trust the substances applied in industrial agriculture production.

Figure 1. Five week-old water spinach, pure-bred from seed in fermented urine solution.

(1) Esrulevic, M Tandoi, V Dalmau, J Lopez, and Pilli, Luca. 2011. "Lactic Acid Fermentation of Human Urine to Improve Its Fertilizing Value and Reduce Short Schistosoma." Journal of Environmental Management 92. 1760-64.

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NUTRIENTS CYCLING IN TWELVE (12) WEEKS

OVERVIEW

In ANTHROPONIX we combine small-scale waste upcycling with plant growing that is sensitively adapted for urban and indoor use. Our bioremediation process includes three basic phases of (A) cultivating lactic acid bacteria and propagating them, (B) collecting, inoculating and stabilising the urine, and (C) diluting the urine in water and exposing it to coco-fibre that helps mineralise the human nutrients so it becomes the growing medium growing your plants. The coco-fibre provides good aeration that stimulates essential bacterial activity permitting 'passive' water based growing without external air pumping. Cultivating lactic acid bacteria takes four weeks (A), fermenting the urine takes three weeks (B) and raising plants from seeds takes another five weeks (C), totalling twelve (12). ANTHROPONIX uses fermentation to stabilise nutrients and eliminate odour because it but doesn't require any electricity input and keeps greenhouse gases emissions at a minimum (compared to other processes like pasteurisation).

QUALITY CONTROL OF URINE

We are aware that many environmental toxins and pollutants (like micro-particle plastics epidemic in our tap water) are entering our perishable bodies are out of control and will end up in your urine. Yet, over the intake and use of foods, drugs and body care products we do have certain control. Pharmaceuticals linger for about two weeks in our organisms and antibiotics which sabotage our fermentation process for up to six weeks [2]. It is advised to abstain from such substances ahead of the urine collection period. ANTHROPONIX users who want to learn more about the substances in their urine we recommend to keep a food and lifestyle journal and do an Urinalysis test before each collection.

LIST OF INGREDIENTS

- Fresh cabbage
- Kosher sea salt
- Molasses or brown sugar
- Still (chloride-free) water
- Morning urine (at least 20 ml)
- Coco-peat substrate (coir, coconut fibre)
- *Optional – Soluble seaweed extract*
- *Optional – Pure wood ash*
- Optional – Biochar or perlite
- Plant seeds (basil, lettuce, watercress or radish)
- *Optional – Plant cuttings (spinach or tomato)*

REQUIRED EQUIPMENT

- Kitchen knife
- Cutting board
- Potato masher (or small glass jar)
- Plastic or wooden cooking bowl (non-metal!)
- Mason jar or large recycled glass jar with lid
- Zip lock bags (small)
- PET drink bottle small with lid (0.5l, for fermenting)
- PET drink bottle large (2.0l, ex for planting)
- Cheese cloth or triangular bandage
- *Optional – Urinalysis test strips*
- *Optional – pH test strips or pH dye indicator*
- *Optional – food and lifestyle journal*
- Pipette or measuring cup (50ml)
- Cutter, scissors and awl (pricker)
- Drill and large (8) mm drill bits
- Water-resistant marker
- Airline tubing (7 mm wide), 150 cm long
- Aluminium foil or white and black acrylic paint
- Small water can

(2) R Medina, D Nagy, A Rose Diego, R Nancy, R Lutz, H Gronlund. 2015. "Analysis of Pharmaceuticals in Food Crops Grown in Urine and Related Products Fertilized Soil." New York Institute, University of Buffalo, State University of New York in Buffalo.

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CULTIVATE + PROPAGATE LACTIC ACID BACTERIA

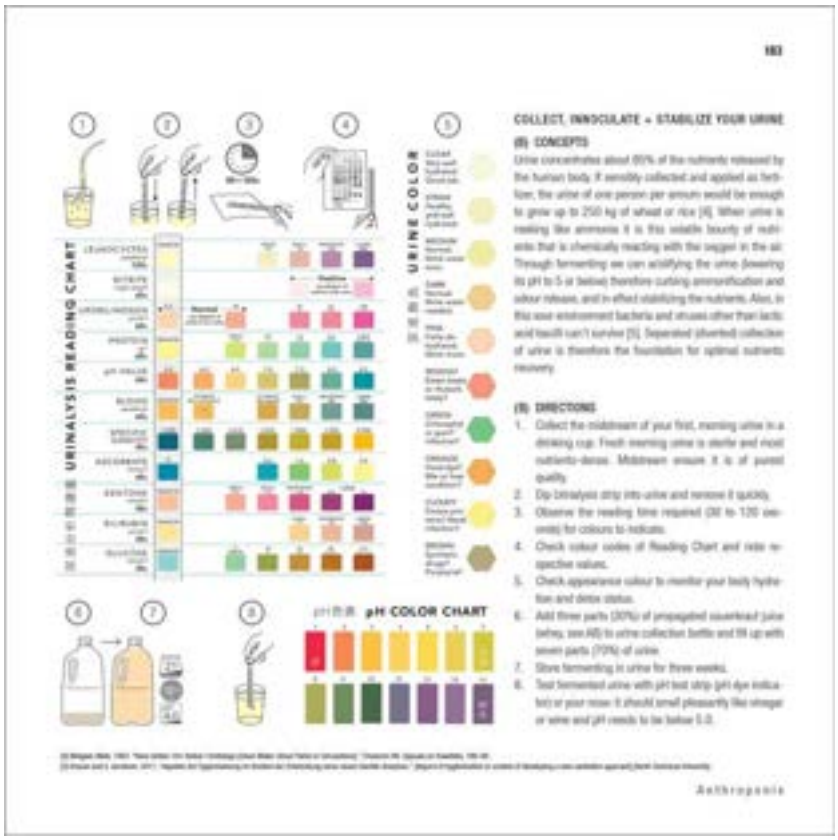
(A) CONCEPTS

There are many different ways of cultivating lactic acid bacteria (from rice-wash residue to bio-enzyme from citrus peels). Here we opt for sauerkraut from fermented cabbage because it is the most effective and ecologically very sensitive option. Amazing about cabbage is that its leaves already contain both the lactic acid bacteria and the sugars essential for fermentation. Because these OM lactic acid bacteria are awakened and raised in your neck of the woods (hence 'indigenous') they are much better adjusted to your specific ecosystem than industrially isolated bacterial strains from the lab [3].

(A) DIRECTIONS

1. Get fresh cabbage. The best season for making sauerkraut is autumn and winter because lower temperatures slow down the fermentation process improving the taste.
2. Remove outer leaves. Shred the cabbage very finely.
3. Mush shreds one layer at time (with a pinch of salt) until saturated with liquid. The salt ensures the sauerkraut gets a crunchy bite (consistency).
4. Stuff cabbage into jar, press down with water-filled Ziplock bag that serves as weight. Close lid tightly. Make sure the cabbage remains soaked in its own juice which keeps the air and mold out. Place jar inside a bucket and store for three weeks in dark, cool space (shield from sunlight). In the fermentation process, excess liquid and carbon dioxide is released over night.
5. After three weeks, sauerkraut is magically to be found in the jar! Squeeze out the juice with (rich in lactic acid bacteria) with cheese cloth that is used as whey for urine stabilisation. Store in fridge in airtight bottle. Eat the remaining solids as a probiotic salad or steamed veggie.
6. Before the sauerkraut juice (whey) can be used to stabilize the urine, it needs to be propagated: provide the lactic acid bacteria with plenty of sugars so they can get to work (since there is no sugars to feed on in the urine). For one part (10%) sauerkraut juice, we add one part (10%) molasses or liquefied, brown sugar and fill it up with eight parts (80%) of tap water that has been aired for 24 hours to be free of chlorine and iodine. Store in airtight PET bottle for one week. Now the lactic acid bacilli should be well fed and releasing carbon dioxide that is bulking up the bottle. This propagated whey is ready to use.

The Field Guide to Hacking



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COLLECT, INNOCULATE + STABILIZE YOUR URINE

(B) CONCEPTS

Urine concentrates about (65% of the nutrients released by the human body. If sensibly collected and applied as fertiliser, the urine of one person per annum would be enough to grow up to 250 kg of wheat or rice [4]. When urine is reeking like ammonia it is this volatile bounty of nutrients that is chemically reacting with the oxygen in the air. Through fermenting we can acidifying the urine (lowering its pH to 5 or below) therefore curbing ammonification and odour release, and in effect stabilizing the nutrients. Also, in this sour environment bacteria and viruses other than lactic acid bacilli can't survive [5]. Separated (diverted) collection of urine is therefore the foundation for optimal nutrients recovery.

(B) DIRECTIONS

1. Collect the midstream of your first, morning urine in a drinking cup. Fresh morning urine is sterile and most nutrients-dense. Midstream ensure it is of purest quality.
2. Dip Urinalysis strip into urine and remove it quickly.
3. Observe the reading time required (30 to 120 seconds) for colours to indicate.
4. Check colour codes of Reading Chart and note respective values.
5. Check appearance colour to monitor your body hydration and detox status.
6. Add three parts (30%) of propagated sauerkraut juice (whey, see A6) to urine collection bottle and fill up with seven parts (70%) of urine.
7. Store fermenting in urine for three weeks.
8. Test fermented urine with pH test strip (pH dye indicator) or your nose: it should smell pleasantly like vinegar or wine and pH needs to be below 5.0.

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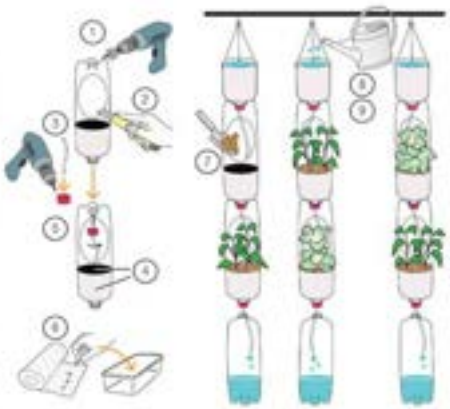
SETTING UP URINE-POWERED WINDOW GARDEN

(C) CONCEPTS

After anaerobic (airless) fermentation in sauerkraut and urine stabilization (A and B) we need aerobic bacterial activity in the last phase so that the organic nutrients turn into mineralised form for plant roots to absorb. Keeping our window garden off the electric grid, we use a passive, hydroponic system where the porous and bacteria-friendly coco-fibre provides the growing medium (with welcome 'nitrogen fixing' and 'phosphate solubilizing') for bringing human nutrients and plant seeds to fullest fruition. This top-to-down, self-dripping vertical garden shown here is just one, very space-efficient option. Other planting setups are viable as well.

(D) DIRECTIONS

1. Drill hole into planter bottle base to fit another bottle.
2. Draw and cut two side openings in each planter bottle.
3. Drill hole into cap for plastic tube of drip water.
4. Cover bottom third of bottle with alu foil or paint (black primer, white finish) as light blocker to avert algae.
5. Hang watering bottles, planters and recollectors into rows: insert bottle neck in base hole, tighten with lid.
6. Start sprouting plant seeds on moist napkin in Tupperware: observe seasonality and varietal needs!
7. Fill lower third of planter bottles loosely with dissolved coco-fibre. If available, mix in biochar dust or perlite for better porosity and cationic exchange.
8. Dilute urine (0.5%) with water (99.5%) at 1:200 ratio. Fill nutrients solution to watering containers, bringing-rate coco-fibre with urine solution.
9. After 2 weeks, double intensity of nutrients solution to ratio 1:100.
10. Check for nutrients deficiencies; add pinch of wood ash or seaweed extract if needed.



PLANT DEFICIENCY GUIDE

The Field Guide to Hacking

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In spring 2017, 22 planting enthusiasts engaged helped us explore the possibility of closing the food loop over two months. Each participant received a 'Grow With Your Own Nutrients' kit that allowed them to collect, medically test and ferment a small, daily urine sample over three weeks at home. In each of those 21 urine specimen – after undergoing lactobacilli fermentation – a lettuce or watercress seed was grown. For comparing how one's eating habits and emotional fluctuations would be reflected in the urine-bred plants, an elaborate journal was provided, for keeping track on daily behaviour, fermentation process and plant development. This home-based urine/plant cultivation routine was guided by five bi-weekly workshops where participants received instalments of supplies, skilling and experience sharing. In wake of the initial technical shortcomings, the intentional biophysical link between person and plant was intensified. The shared, more-than-human precariousness provided a springboard for participants' creativity, sociability and imagination.

In our time of insatiable energy demand, increasingly organic waste, including human waste, ends up powering bioreactors, engines and batteries. In the age of environmental depletion and nature-human dichotomy, more mutually replenishing, more concrete and direct ways of nurturing our living foundation is required. Here human waste approached not just as energy supply but as life force lets us test out sociable technologies and living feedback protocols in a given context.

ANTHROPONIX was made possible with the generous support of a dedicated seed grant from Design Trust (Ambassadors of Design in Hong Kong) and the Internationalisation Grant from the Dutch Creative Industries NL in Rotterdam. It allowed to produce a urine-to-plant growing prototype and project documentary by videographer Benson Law. More info on www.facebook.com/Anthroponix

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APPENDIX — CHAPTER 2

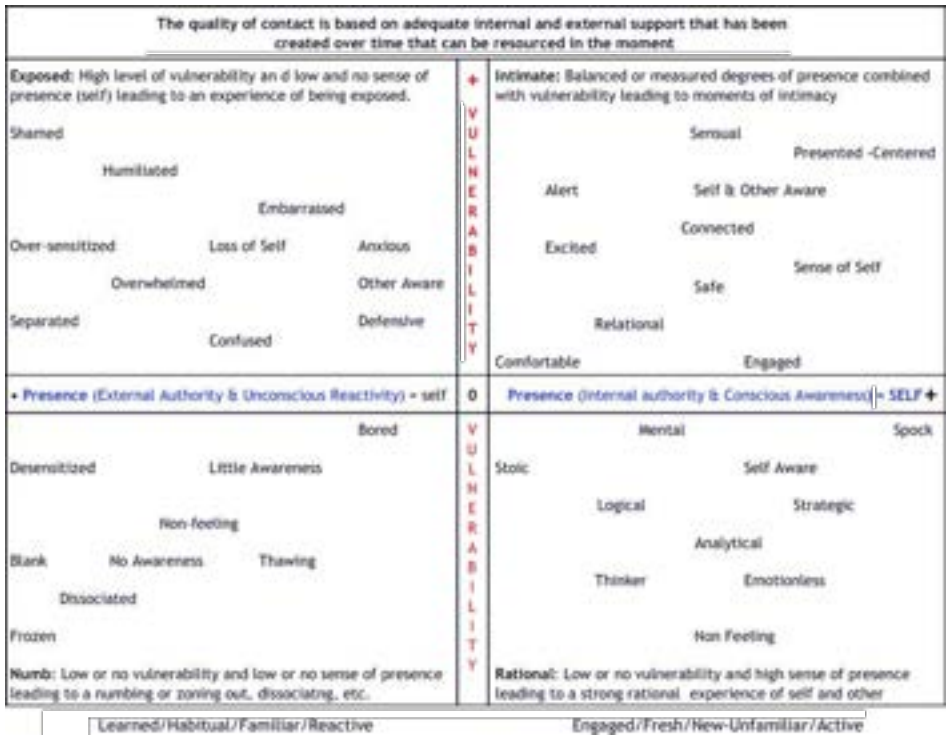
Literature Documentation

Existential mapping

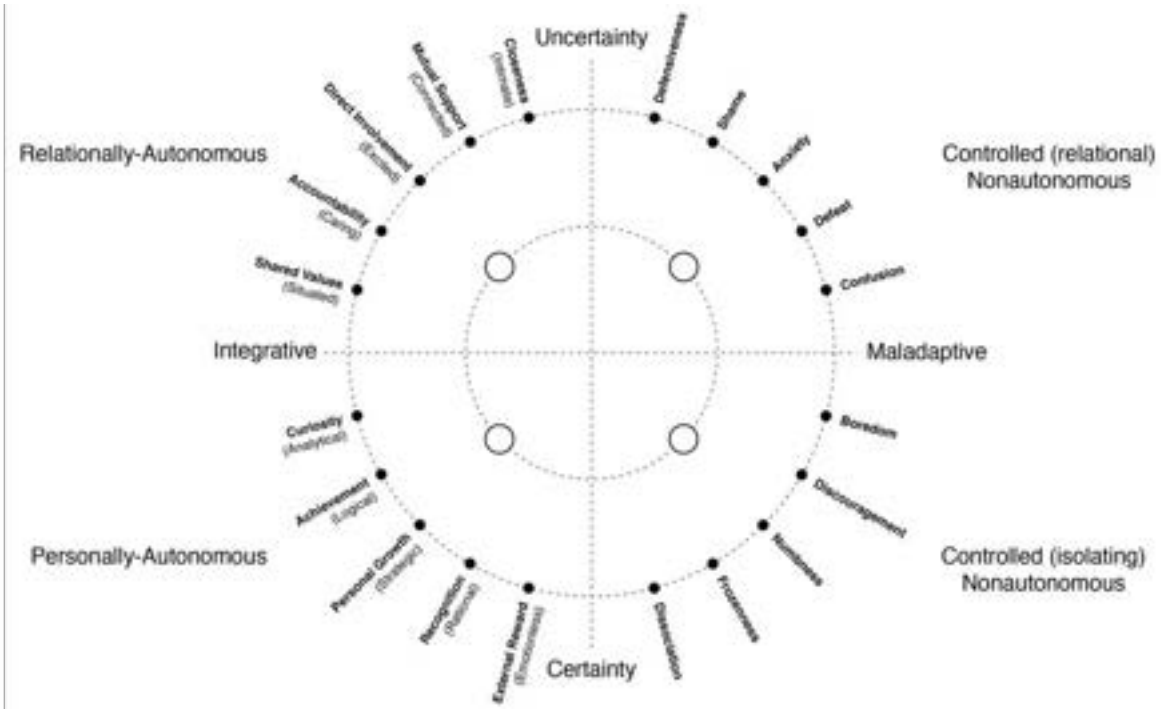
Vulnerability-internalisation quadrant and chord diagram

Herbert Stevenson's (2016; 2005) contact model (top) that inspired the integrative autonomy chord (bottom) that opens room to register existential journeys in the temporal dimension.

Contact model **quadrant**



Integrative autonomy **chord**



APPENDIX — CHAPTER 3

Participant Enrolment & Study Instruments

Call for participation

Participatory study *ANTROPONIX*

The ANTHROPONIX study took place between 1 April to 13 May 2017 and originally titled *Golden Growing*. The call for participation (see leaflet below) described the study as citizen science project and was widely circulated through personal invitations and social media.

Online questionnaire for participant enrolment

Participatory study *ANTROPONIX*

Study candidates accessed the Google Form via URL link distributed through Facebook, email, text messaging and leaflet handouts. The questions were designed to learn about the candidates' motivations as well as probing their willingness to be inclined conversation partners for the shared, explorative journey ahead. Question (1) was to ensure that no antibiotic substances would enter into the fermentive ecologies of the foodloop and undermine the probiotic urine stabilisation process.

加入自己的元素，栽培有你特質在內的植物！

Register as ANTHROPONIX Test-Grower!

計畫為公民科學研究試驗，舉辦日期由 2017 年 4 月 1 日至 5 月 13 日。
閣下填妥之所有信息將嚴格保密，僅供內部和學術使用。
首先感謝你對 米斗工房. GOLDEN GROWING 的興趣。由於成為參與者數量有限，為了確保項目的多元性，我們想先了解關於你和你參與項目的動機。

注意事項：請填妥此表格（一人填寫一份），並於 2017 年 3 月 28 日或之前提交。我們將確認您的申請並於 3 月 29 日前通知您。被挑選之參與者在日後會被邀請進行一個會面訪談。

Citizen Science Research Trial from 1 April – 13 May 2017.
ALL INFORMATION IS KEPT STRICTLY CONFIDENTIAL AND FOR INTERNAL AND ACADEMIC USE ONLY.

Thank you for your interest in GOLDEN GROWING. The number of study participants is limited. To ensure a diverse contribution to this project, we like to know more about yourself and your motivations.

DIRECTIONS: Fill out this form (one for each candidate) and submit no later than 28 March 2017. We will confirm your application and notify you by March 29. Selected participants will be invited to an intake interview.

* Required information

Citizen Science Application: Please enter personal information	
Email address * *Your email:*	英文姓名 – Name *中文姓名 – Chinese Name *First and last name:*
聯絡電話 – Phone number * *Your answer:*	居住地址 – Home Address, Street, District, Town * *Your answer:*
年齡範圍 – Age Group * *Choose:* 1–10; 11–20; 21–30; 31–40; 41–50; 51–60; 61+	

Please enter study-related information	
1	在過去 6 周，我有因牙科手術、肺炎、與呼吸道感染、中耳炎、骨骼感染、生殖泌尿道感染、皮膚感染相關治療等服用了抗生素 – In the past 6 weeks I took antibiotics (Penincillin, Keflex, E-Mycin, Zithomax, Floxin, etc.) for dental procedures, surgery, infection treatment etc.: * *Choose:* 有 – Yes; 不肯定 – I am not sure; 沒有– Certainly No
2	職業 – Occupation * *Choose:* 全職工作人士 – FT Employed; 半職工作人士 – PT Employed; 家庭主婦 – Homemaker; 全職學生 – FT Student; 半職學生 – PT Student; 退休 – Retiree; 失業人士 – Unemployed; 其他 – Else
3	專業領域 (例如設計、電子工程、音樂) – Professional Field (e.g. Design, IT, Music, etc.) * *Your answer*:

4	居住樓宇類型 – Housing Type * *Choose:* 間房 – Dorm; 共用單位 – Shared Flat; 獨立單位 – Flat in Complex; 共用房子 – Shared House; 獨立房子 – Single House; 船屋 – House Boat; 居住車 – Trailer; 其他 – Else
5	有多少人與你共同居住 – Number of Persons Living in your Household * *Choose:* 1; 2; 3; 4; 5; 5+
6	家中有多少植物 – Number of Plants Living in your Household * *Choose:* 1; 2; 3; 4; 5; 5+
7	關於你的種植的經驗 – Plant-Growing Experience * *Choose:* 沒有(最多只有人造植物) – Zero (plastic plants only); 少量(如仙人掌) – Little (cactus); 中量(如食用植物) – Medium (kitchen herbs); 大量(如擁有花園作種植用) – Advanced (garden); 超量（如擁有田地耕種） – Pro Level (farmer)
8	有否參與食物製作過程 – Involvement in Food Preparation * *Check multiples* (可揀選多項)： 經常外出用餐 – Always eat out; 家人煮食 – "Hotel Mama"; 偶然自行煮食 – Occasionally cook; 間中自行煮食 – Regularly cook; 經用自行煮食 – Always cook
9	有沒有發酵和醃製的經驗（如泡菜，酸奶，啤酒 – Experience with Fermenting & Enzyming (pickles, kimchi, kefir, beer) * *Choose:* 沒有 – Zero; 少量 – Little; 中量 – Medium; 大量 – Advanced; 超量 – Pro Level
10	有沒有製作身體護理產品的經驗（如肥皂，牙膏）– Experience Making Own Bodycare Products (soaps, toothpaste etc.) * *Choose:* 沒有 – Zero; 少量 – Little; 中量 – Medium; 大量 – Advanced; 超量 – Pro Level
11	如廁的習慣 – Engaging with Toilet Routine * *Check multiples* (可揀選多項)： 沒有理會 – Don't care; 間中檢查排泄物 – Check sometimes my excrements; 經常檢查排泄物 – Regularly monitor my excrements; 間中檢查尿液 – Check sometimes my urine; 經常檢查尿液 – Regularly monitor my urine; 喜於用坐廁 – Prefer seating toilet; 喜於用企廁 – Prefer squatting toilet; 曾使用過堆肥廁所 – Used compost toilet before
12	我可以在 4 月 1 日至 5 月 13 日期間每日以約 10 分鐘紀錄活動過程 – I am able to keep a Journal for 10 min/day between 1 April – 13 May * *Choose:* 可以，過往都曾參與紀錄活動 – Yes, sure, did journaling before; 可以，過往未曾試過紀錄活動 – Yes, but never done journaling before; 可能 – Maybe; 未必 – Not really
13	我可以在以下日期(星期六,下午 2-3 時)於香港理工大學參與五個研討會 – I am able to attend 5 Workshops (2-3pm) at Hong Kong Polytechnic University on the following Saturdays: * *Check multiples* (可揀選多項)： 1 April; 8 April; 22 April; 29 April; 13 May
14	什麼原因令你對這個項目有興趣（試簡單解釋）– What triggered your Interest in this Project (explain in a few sentences)? * *Your answer:*
15	有甚麼促使你參與和堅持在 6 個星期中參與此項目 （試簡單解釋） – What motivates you to join and remain in this project for 6 weeks (explain in a few sentences)? * *Your answer:*

感謝你的申請和用心分享有關你與微生物、植物的生活！

Thank You for your application and intention to share a tiny passage of your life with fellow microbes and plants!

[ ] Send me a copy of my responses.

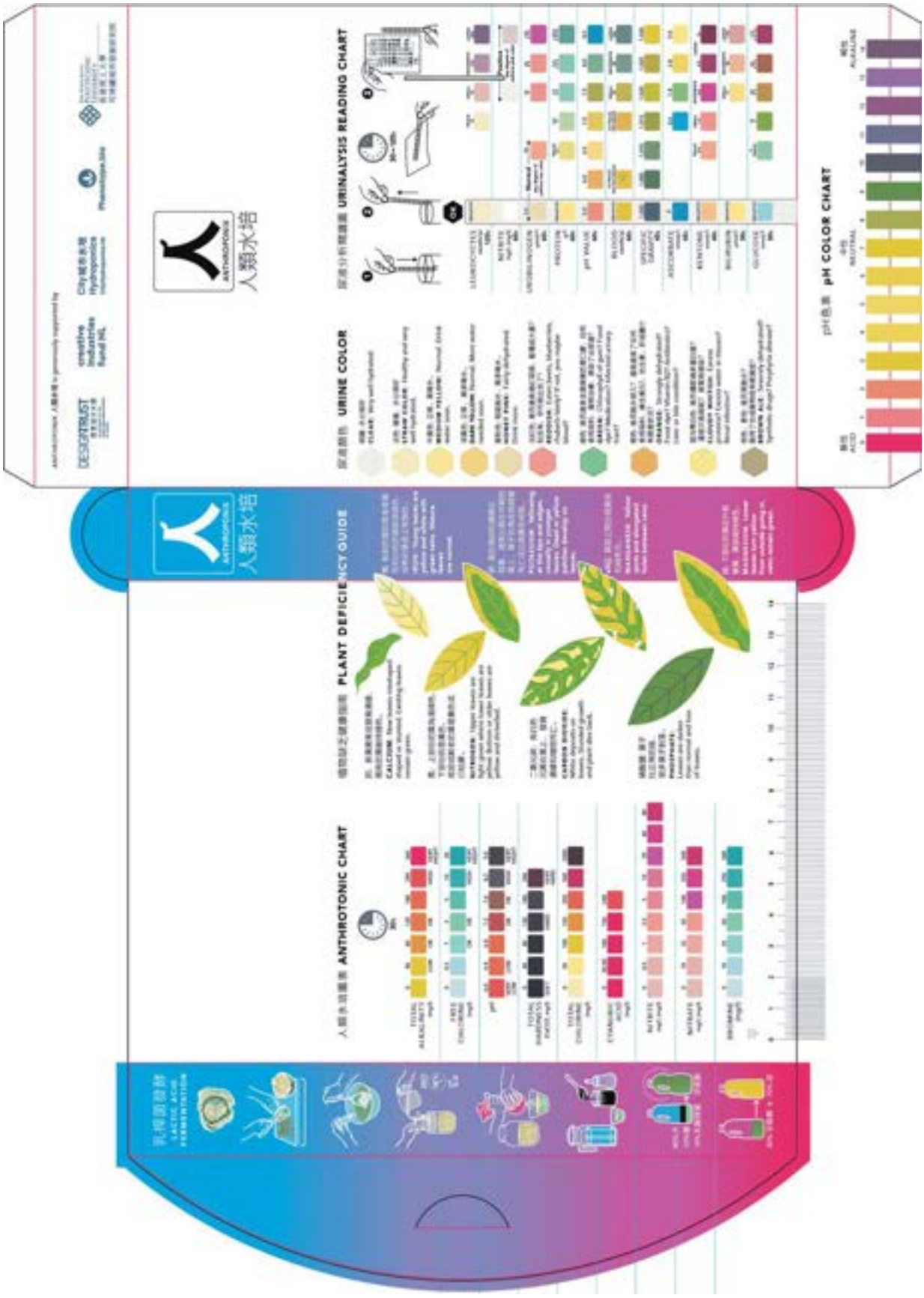
SUBMIT

Journal of mutual flourishing: Cover sleeve

Participatory study *ANTROPONIX*

(folded sized DIN A5)

Reference guide and instructions for biopedagogic monitoring of human, plant and bacteria thriving

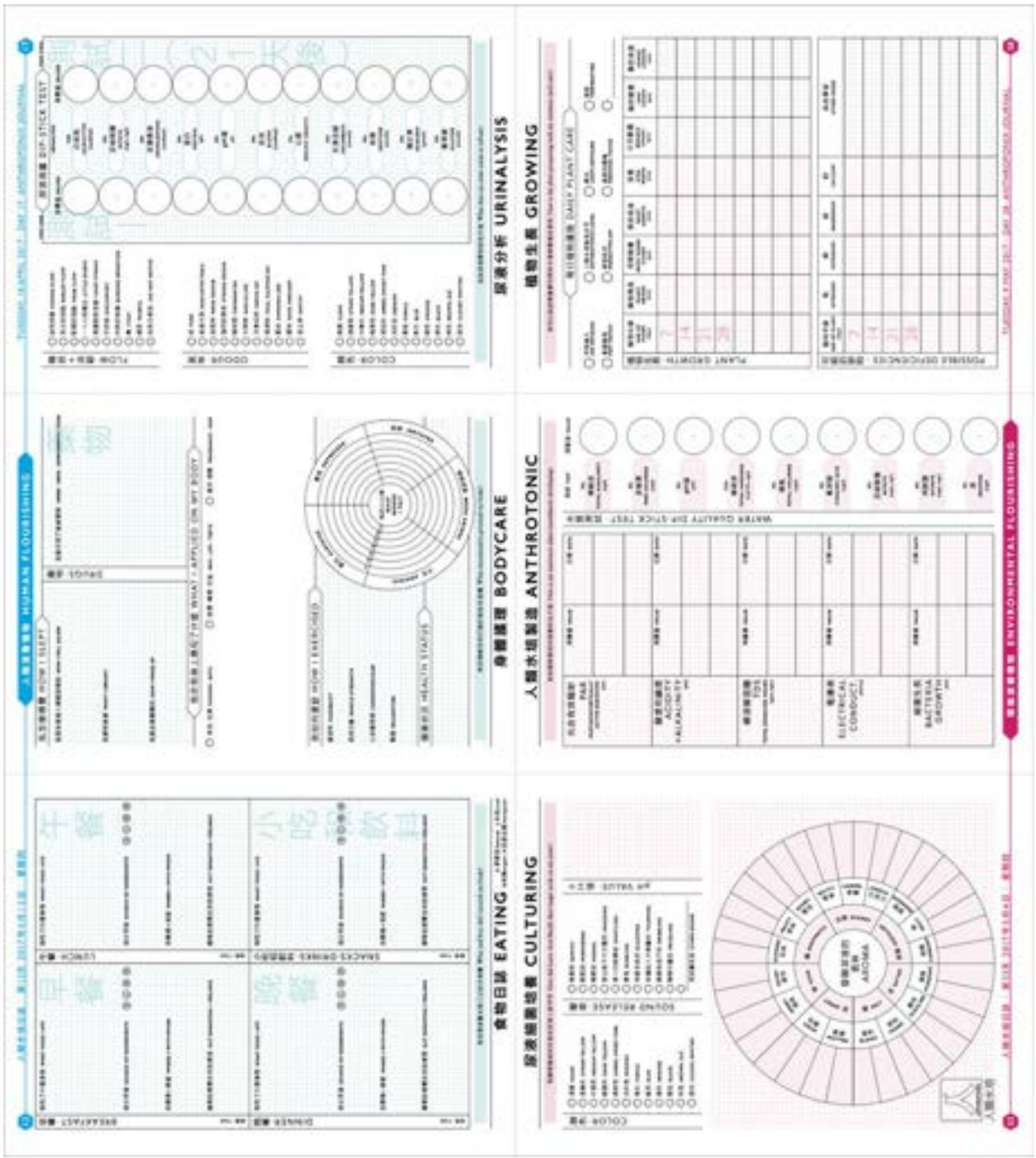


Journal of mutual flourishing: Diary entry sheet

Participatory study *ANTROPONIX*

(folded sized DIN A5, open sized 44 cm x 42 cm)

With the biopedagogic references on the sleeve, study participants tracked their eating habits, Urinalysis values, odour of urine ferment, growing solution, and plant development markers. Each diary entry sheet featured two parts, one for Human Flourishing (blue, left side), the other for Environmental Flourishing (red, right side). On the day of urine collection, participants completed the Human Flourishing part, and three weeks later, when the urine specimen was fermented and ready to use, they would start monitoring Environmental Flourishing in planting solution and vegetal offspring.



Schedule for intake interviews

Participatory study *ANTROPONIX*

Before and after the seek-week study period, all 22 participants reflected in conversations with the researcher about their homemaking habits, toilet routines, and plant nurturing skills. Originally, the plan was to apply the same schedule of questions for both interviews in order to compare how attitude and demeanour would change. Yet when the study had horti-technically failed, a separate schedule for the exit conversation was developed.

Theme: **How do I experience biological circulations* in my own body and around me?**		
	Warming up question: How did you learn about this project and what made you apply?	
	Choosing my food, medications and body care	• P R O M P T S
1	Can you tell me about what makes a fulfilling eating experience for you?	• How do you feel about obtaining and preparing food? • Why do you think your choices of foods affect other life forms? • How does your body feel before and after a yummie meal? • What was the last meal when you felt truly connected to the source of your food? • *Thoughts/ associations/ fantasies*
	Living with my metabolism	
2	Can you tell me about (little) pleasures you find with your digestion and toilet routine?	• On the sensuous, bodily level what happens for you 'when nature calls'? • What prompts you engage more or less with what is released from your body? • What do you discuss from your toilet routine with others? Responses? • What relevance do you find has your toilet routine on society and the planet? • *Thoughts/ associations/ fantasies*
	Working together with microbes	
3	How do you feel about bacteria and what kind of role do they play in your life?	• What do you think people get out of fermenting stuff (veggies, enzymes, or brews)? • How do you feel about composting human waste into veritable fertiliser? • Where do you sense are the joys and challenges of "working with microbes"? • How do you feel about the microbiome and that we are "more bacteria than human"? • Thoughts/ associations/ fantasies
	Growing plants	
4	What kind of relation/connection do you have to plants?	• What does it take for you to growing or even enjoying plants? • What is your reaction to flourishing or floundering of plants? • What are the roles of plants in your own life? • How do you feel about growing plants with nutrients released by your body?
*) my participation in growth & decay		

Schedule for exit interviews

Participatory study *ANTROPONIX*

For the second interview at the end of the study, the schedule was designed to inquire how motivations had changed in the face of obstacles and failure. This schedule was complemented with personalised questions for each participant that related to specific observations, exchanges or concerns, that had emerged during the six-week study period.

Theme: **Reflecting on turbulent collaboration and reasons for overcoming failure**		
	Warming up question: We met here six weeks ago, how do you feel now?	
	Personal perseverance	• P R O M P T S
1	What made you stay in the project?	• What motivated you (initially) subsequently to participate in the project? • What was your (first) subsequent reaction to this project? • What kept you going day by day for over six weeks? • Looking back, why or why not would you sign up again?
	Partaking and working in the group	
2	How was your experience in this group and workshops?	• What was your role in the group and did that change? • How did you go about addressing your concerns in the group? • What made you feel good / not so good about the group • How did this group compare to other cooperative situations?
	Applying skills at home	
3	What was your experience of this applied science project?	• How did you feel about instructions, tools, and journaling? • What did you think about the bioscientific testing? • How did the fermenting influence what you sensed and noticed? • How can the procedures be more practical for longer duration? • What are you going to do with the planters, journal and urine kit?
	Reflecting Further on meaning	
4	What did you discover about yourself in the course of the project?	• What did you learn from the fermenting and growing? • How do you feel about your role in biological circulations now? • Are there aspects you will miss or ponder about after completion? • What do you take with you personally from this experience? • What do you share with friends and family about your experience? Is there any particular image or moment that will stay with you?

Feedback work sheet to stimulate peer-to-peer feedback

Participatory study *ANTROPONIX*

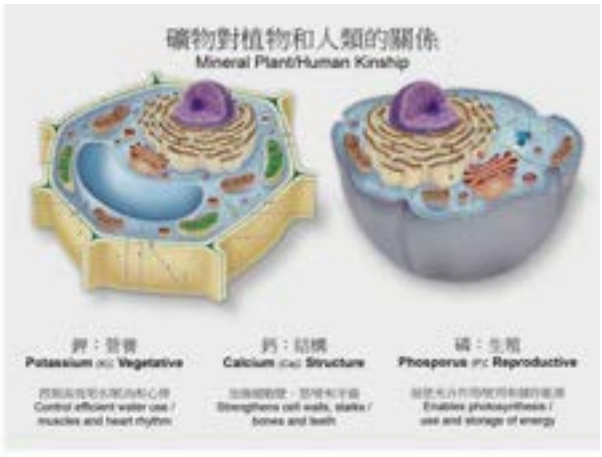
Every of the five biweekly workshops began with a 15-minute long reconvening feedback segment where participants received this questionnaire work sheet for collecting answers from peers in brief, one-minute intervals. This helped participants to get acquaint themselves with others and speed up knowledge exchange after two weeks of working independently at home. These peer-to-peer reporting exercise also allowed the facilitators to eavesdrop on the emerging themes and needs among participants.

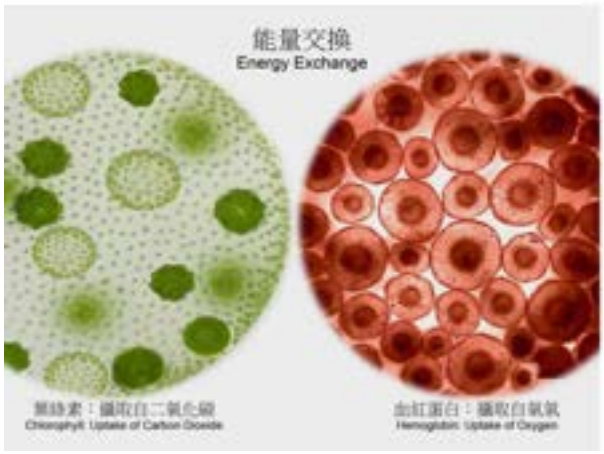
ANTHROPONIX Go-Around Feedback (26 April 2017)		
	Task: *Mingle with peers and ask for answers from 3 different people on each questions. Spend one minute per person and question.*	
	QUESTION	RESPONSES
1	有甚麼方法可以令你的植物（如在雨天）吸收足夠的光源？ What do you do to provide enough light to your plants (in this rainy weather)?	Name 1: [__] Answer: _____ Name 2: [__] Answer: _____ Name 3: [__] Answer: _____
2	在將空氣吹到植物的根部的環節上有沒有甚麼特別？ How is it going with aerating the roots of your plants?	Name 4: [__] Answer: _____ Name 5: [__] Answer: _____ Name 6: [__] Answer: _____
3	你如何將尿液營養素的準備、各測試和日誌填寫融入生活？ How do you fit fertiliser solution preparation, substance testing and journaling into your life?	Name 7: [__] Answer: _____ Name 8: [__] Answer: _____ Name 9: [__] Answer: _____
4	如你的植物（和種子）會與你對話，你有甚麼想告訴他們？ IF your plants (and seeds) had a voice, what would they tell about you?	Name 10: [__] Answer: _____ Name 11: [__] Answer: _____ Name 12: [__] Answer: _____

Biopedagogic ‘multilogue’ lecture slides

Participatory study *ANTROPONIX*

Each hortitechnical topic in the workshops of the main study was represented by slides that utilised microscopic imagery or art-historical references to put ecological principles and the interrelation of life forms in direct relation with human conceptions and experience. The side-by-side human-nonhuman comparisons made visual connections in regard to energy cycle, anatomy, and perceptual systems.





APPENDIX — CHAPTER 4

Provotypes' Set-up

Commentary submitted on New Agricultural Policy

Public consultation on Sustainable Agricultural Development in Hong Kong in spring 2015

Public Consultation on The New Agricultural Policy:

Sustainable Agricultural Development in Hong Kong

Name:	Markus Wernli, PhD candidate, Urban Environments Lab (V1013)
Organisation:	The Hong Kong Polytechnic University, School of Design & Deptartment of Civil & Environmental Engineering
Commentary:	20 March 2015
	Dear Agriculture Branch Thank you for inviting comments to The New Agriculture Policy. Foremost I welcome the basic notion of the policy draft to reinvigorate the agricultural sector in Hong Kong. From my research in urban farming I see a lot of potential in increasing productivity of organic foods, biowaste management, and ecological services (carbon trapping) through a holistic cultivation approach that sensibly integrates all these elements. The policy draft describes plans for the development of infrastructure in the Agripark including sewerage, power supply and an In-Vessel composting treatment facility for food and biomass recycling. This is not explained in much detail. If the new policy wants to establish synergies and optimise ecological performance at the heart of the Agro-Park (its utilities), then I suggest to consider the production of clean, high-temperature charcoal dust (biochar). The durability and super-porous microstructure make biochar a long-term storage medium for the soil's microbe life, plant nutrients and moisture. Soils amended with biochar have proven to be very resilient to weather extremes and nutrients fluctuation. The extraordinary vitality of biochar-enhanced soils provides outstanding fertility and climate change mitigation (Lehmann, 2009). The feedstock for biochar production comes from dried organic waste from agriculture (husks), animal husbandry, food production, sawmills (saw dust), forestry (clippings) and construction (wood debris) – resources that normally are incinerated and dumped into landfills or water bodies. With a hydrothermic pyrolysis system in place (for example Pyrech biogas kiln or Schottdorf biochar reactor) it is economically viable to convert large amounts of biowaste not only into prime soil amendment, but also produce electricity and hot water suppy for homes and industries of an entire village. In the larger context, biochar is part of a closed-cycle resource management system called Terra Preta ('black earths') that integrates sanitation, biomass reuse, soil revitalisation and water protection (Otterpohl, Reckin, Pieplow, 2010). This ancient, recently rediscovered, cultivation method relies on the two-stage process of lactobacilli fermentation and vermicomposting. Contrary to regular composting, Terra Preta is fermentation-based and minimises the 'wild decomposing' of organic matter (destructive rotting), which eliminates malodours and curbs potent greenhouse gases like methane. The addition of charcoal dust and lacto-acid bacteria allow for a conversion without air exchange that efficiently eliminates pathogens (GS Itchon et al, 2010) while stabilising nutrients into a form that caters well to the metabolism of plants (Reckin, 2010). Thank your for considering this comment. If this is of interest to you, I am happy to discuss this further. Here are more online resources: http://www.biochar-international.org http://en.wikipedia.org/wiki/Terra_preta Sincerely, *Markus Wernli* Email: markus.wernli@
References:	H. Factura, T. Bettendorf, C. Buzie, H. Pieplow, J. Reckin and R. Otterpohl, 2010. Terra Preta Sanitation: re-discovered from an ancient Amazonian civilisation - integrating sanitation, bio-waste management and agriculture. Jürgen Reckin, 2010. New Insights in matters of Plant Nutrition, Soil Microbes and their role in Recycling of Human Excretas and regenerating Soil Fertility GS Itchon, AU Miso, Gensch R, 2010. The Effectivity of the Terra Preta Sanitation (TPS) Process in the Elimination of Parasite Eggs in Faecal Matter: A Field Trial of Terra Preta Sanitation in Mindanao, Philippines Johannes Lehman, 2009. Terra Preta de Indio: Amazonian Dark Earths and the global climate.
	Thank you for your commentary. Please return your comments by email to agri_policy@afcd.gov.hk, by fax to 2152 0319 or by post to the Agriculture Branch, Agriculture, Fisheries and Conservation Department, 7/F, Cheung Sha Wan Government Offices, 303 Cheung Sha Wan Road, Kowloon, on or before 31 March 2015.

Grant proposal for grassroots communal rooftop composting
Field experiment with five independent rooftop gardens

HAO RAN GLOBAL PARTNERSHIP 浩然資助計畫 GRANT PROPOSAL

Compost Alliance: Fermenting the City 城市在發酵

Democratizing Composting in Hong Kong to Reconnect Urbanites with their Environs and Neighbours
Black Circle 香港大都会黑土 in collaboration with HK SoIL 鄉土學社
31 July, 2015

OUTLINE: **This is a collaborative proposal by urban farms across Hong Kong to propagate citizen-initiated composting that revitalises both local soils and resilient, local ecologies. Implementing a localised version of Urban Terra Preta together with an enthusiastic network of local farmers, we will create a living model of holistic resource management for urban households in Hong Kong (and beyond). Urban Terra Preta is based on ancient, indigenous knowledge to upgrade organic waste into safe fertiliser without relying on any electricity, water, chemicals and high-tech machinery. This integrated cultural method for closing material and energy cycles is based on a two-stage process with lactic acid fermentation (in-vessel Bokashi), and biochar-enhanced vermicomposting that we carefully adapted to Hong Kong's ultra-urban condition. With a communal support system in place, everybody can now reduce organic waste day by day while improving the city's quality of life.**

I. PROBLEM

Every day the municipal waste system in Hong Kong is adding 4000 tons of organic refuse to its landfills. and since there is no system to capture exhaust in place this rotting material (precious plant nutrients in fact) is emitting huge amounts of greenhouse gases. Most notably, landfills provide anaerobic conditions known to produce high amounts of methane, which is 200 times more potent than CO_2. About 90% of the organic waste originates at household-level. Unlike metal, plastic, paper and glass, people in Hong Kong find no recycling options for their kitchen refuse and therefore mix it in with regular trash destined for landfill. Contrary to other solid waste, (which is often recovered by informal waste collectors after disposal), organic material needs to be separated and preprocessed right at the source to prevent it from spoiling and to retain its (nutritional) value.

While many countries are implementing resource-oriented management systems for reuse of organic waste in agriculture and for energy generation, Hong Kong has no concrete management scheme for putrescibles in place. The government recently commissioned a large waste incineration plant (against strong popular opposition) to alleviate the bursting full landfills. This lack of a holistic, environmental vision is also evident in the New Agriculture Policy presented earlier this year where the intrinsic value of compost was hardly mentioned because the government has no consideration for ecosystem services from urban farming and closing organic resource cycles. In contrast to cities like Tokyo or Berlin – which impose steep bag fees on regular trash to boost recycling – people in Hong Kong have no incentive to sort out and reduce their waste.

In the absence of governmental intervention and left to the 'free market', a group of private businesses is seeking out lucrative, cost-effective niche markets like the reuse of food wastes from the gastronomy industry that is made into pig feed. With rising commodity prices for refined and upgraded organic wastes like biofuels and biochar, it is to be expected that more indifferent entrepreneurs in Hong Kong will follow and get into profit-driven waste processing focused on short-term gain rather than investing into human and urban ecologies.

Urbanites everywhere in the world like gardening, and people in Hong Kong are no different. What is different is that indoor gardeners and commercial rooftop farmers are buying planting soils imported from the Netherlands and Germany – (or hydroponic systems from Taiwan and Japan –) while valuable plant nutrients from domestic organic waste is going to waste instead of enriching the local soils. Rather than solely focusing on scale and technology, the urban farms collaborating on this proposal strive to bridge the socio-environmental disconnect that is more acute in Hong Kong than anywhere else. By opening up our rooftopsgarden patches, composting bins and passion for soil, we want to encourage a diverse range of people to engage with their biological and social foundations through a carefully-guided, collective composting practice. It is high time we green the barren 'heat sinks' we call rooftops and spice up the sterile public parks with flower-power grown from our self-cured, homemade soils.

II. PURPOSE

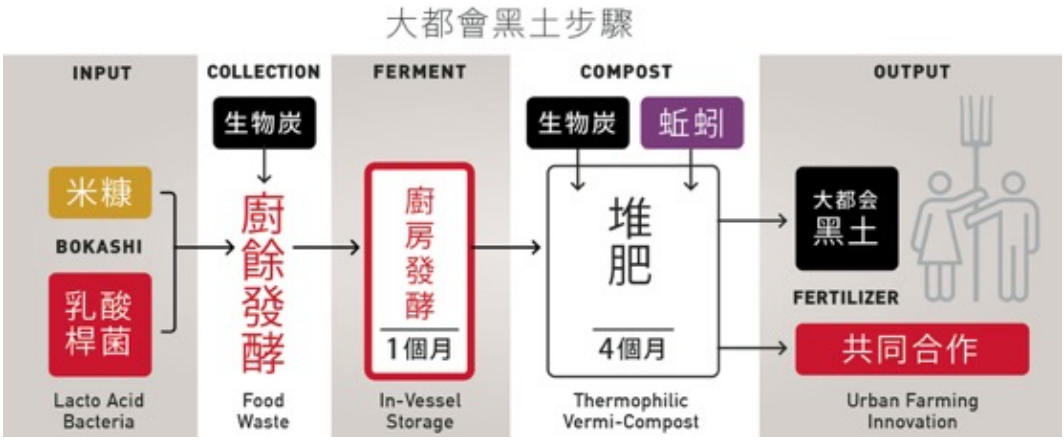
Fermenting the City 浩然基金會 is introducing Urban Terra Preta 大都会黑土 – the in-vessel composting of kitchen waste with addition of fermenting rice bran and charcoal – as a cultural model of household-level resource management to Hong Kong. A strong social fabric between farms, organic waste producers and composters will be the foundation for urban greening & and farming strategies (use for the soils produced). This localised engagement will also help minimise

the logistics and ecological footprint. We want to set a living example for how personal composting is part of shaping and improving quality of life and can make the city into an emerging 'landscape of shared learning'.

1. Social Fabric: The lack of available land in Hong Kong is always mentioned to dismiss decentralised composting on individual level. For this reason this study focuses on social and collaborative aspects that can overcome these mental and spacial-architectural obstacles. The integrity and usefulness of our composted material depends on careful separation and processing right at the source in the kitchen. The required behavioural change can only be sustained in a rewarding group effort of mutual mentorship and active? where the coordinators lead by example and participants are actively involved in all stages of the project. Shared learning means that home composters take part in peer-to-peer trouble shooting, playful competitions, convivial events and experience-driven bonding.

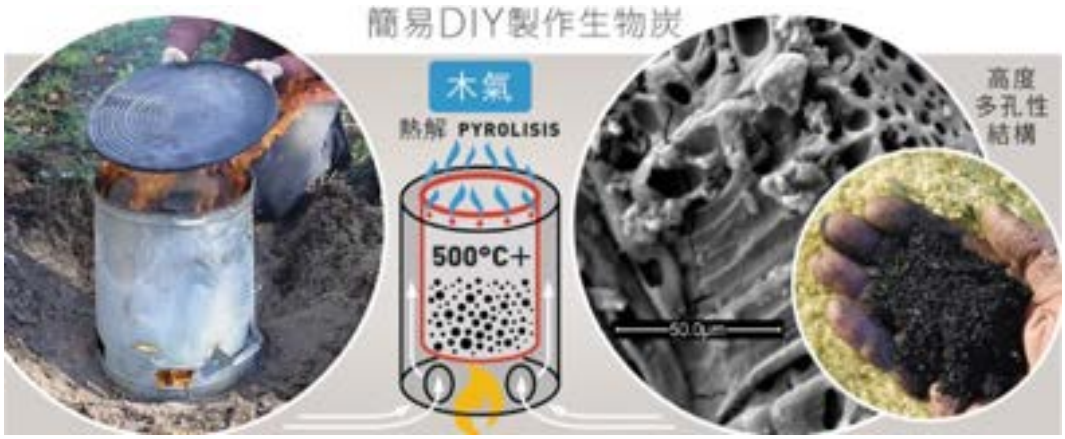
2. Experimental Urban Greening & Farming Strategies: We take inspiration from examples of grassroots composting and gardening in cities places like Tokyo (Sorado Farms ソラドファーム恵比寿 - まちなか菜園), Berlin (Prinzessinnengärten 公主花园) or Brussels (Usine du Trésor Noir 黑寶廠) where local residents experiment and sustain innovative models of urban farming and cohabitation. Currently 香港大都会黑土 Hong Kong Urban Black Soils is testing out different methods and applications of 大都会黑土 Urban Terra Preta in Tai Po Market, New Territories. Here wWe are exploring the usefulness of urban freshly generated compost material applied how its application in urban density close to its source is contributing to ecosystem services for humans and the environment.

3. Fertile 大都会黑土 **Urban Black Soils (Terra Preta):** *Terra Preta* 黑土 is a clean and emission-free way to close the nutrients cycle linking organic kitchen waste and plants. It produces soils renown for their long-lasting fertility ('dark earths'). In the process pathogens are eliminated and plant nutrients are conserved without any chemical, energy and water input. Characteristic for Terra Preta is a two-phase process with lactic acid fermentation of the biomass, and composting enhanced by charcoal dust.



((image caption: On the household-level the Terra Preta 黑土 method is implemented simply with a closed container for fermenting kitchen scraps and composting with two stackable planter boxes. Similar to homemade, fermented foods it is fairly easy to cultivate lacto acid bacteria from scratch.))

Food and yard waste are not suitable to nourish plants unless a wide range of bacteria, protozoa and fungi are in place to make nutrients metabolically available to the feeder roots of plants. Lactic acid bacteria – cultivated inside of rice bran with through addition of sauerkraut juice, 'rice wash residue' or Effective Microorganisms – accelerate this conversion while effectively preventing organic matter from gas-producing aerobic degradation through a contained process – stabilising nutrients, eliminating pathogens and malodours. This makes Urban Terra Preta suitable for densely populated areas without any need for costly infrastructure.



Biochar is charred biomass (dried woody wastes, food processing residues), which is added to soil to improve soil health and soil quality. The solid, charcoal-like substance is created using a process known as pyrolysis, which is basically the heating of biomass to a high temperature (400° degrees C or higher) in the absence of oxygen. Due to its extremely porous and indestructible structure, biochar provides a stable buffer medium for beneficial soil microbes and prevents nutrients from leaching out. The addition of biochar to soils is an ancient technique used by early civilisations around the world and provides regenerating, long-lasting fertility. Recent research suggest that biochar sequesters carbon dioxide from the plant material and makes soils into 'carbon sinks'. A simple DIY rocket stove is sufficient sufficient to produce a limited supply of biochar.

III. GOAL

Our main goal is to establish user-centred, sensible ways of composting where participatory and collective learning is part of action. This approach democratizes urban resource management by involving local biowaste producers from local households and industries as full collaborators who co-determine planning, collect data, analyse findings in an effort to make composting in combination with urban farming a good value proposition for common people in Hong Kong. To make Urban Terra Preta practice viable we pursue these objectives:

1. Investing in People and Relationships: For overcoming obstacles and changing personal behaviour the social support system is a key factor. Our five collaborating urban farms will establish a Fermenting Station on their premises that is part of a Compost Alliance. Each Fermenting Station consists of a group of trained Terra Preta mentors who accommodate up to ten compost-practising families. Collectively all members of a Ferment Station are collectively responsible for the timely provision of fermentation supplies. On-site biochar kiln (rocket stove), bokashi storage (fermenting rice bran), gardening gear and a Terra Preta dry toilet allow composters to take turns in the selforganised compost preparations. Terra Preta mentors and composters alike will connect with food manufacturers (tofu, beer, tea, rice shops nearby) and intercept with organic waste streams in their neighbourhood for producing the best possible fertiliser. This so-called Compost Alliance is a distributed initiative across Hong Kong propelled by building a socially rewarding value chain of recovered and shared vitality.

2. Recover Plant Nutrients for a Greener City: Claiming responsibility for sensibly upgrading organic waste into soil necessitates a proper use for it. It is our ambition to stimulate discussions, negotiations and action on the ground to help make Hong Kong a more plant-friendly place. Lets declare the making of healthy compost a basic human right.

While our Ferment Stations will provide soil and planting refuge as a last resort, it is our aim to establish meaningful use of compost as close to the composter's life radius as possible.

3. Holistic, Minimal-impact Project Cycle: While managing waste we don't want to use up extra resources or add to pollution. All our activities must be geared to recover and detoxify wasted resources into a new source of vitality. As a sample of integrated resource management our system needs to reduce waste, promote a culture of care and improve the socio-biological foundations of urban life. One challenge is to meet our need for transportation of essential supplies (like rice bran) across the city. Hence we seek to work closely with the municipal's Pilot Green Transport Initiative that administers 44 electric vehicles.

4. Remote Collaborations and Satellite Compost Alliances: Our aspiration is to inspire urban farmers around the world to build up their Compost Alliances. With more 'fermentizens' in different places our knowledge and impact can grow. Urban farmers in Guangzho and Guangdong (Pearl River Delta) expressed already strong interest in adopting the Fermenting the City approach. We will support them with all our means in that effort.

5. Mobilising Social Investors: Obviously we want to sustain fermentation-based composting after the one-year period and scale up Fermenting the City 城市在發酵 beyond the initial 50 households. The learning from this model project will inform how we can integrate bokashi fermentation (including their social dimension) for example into the municipal recycling centres that could serve an entire neighbourhood. We would like to see the 300 tons of daily wood wastes in Hong Kong upgraded into Biochar. This will necessitate a state-of-the-art Pyrolisis Facility which is a controlled carboniser with a thermic system that captures the released energy for use in industry or households. Fermenting the City 城市在發酵 must therefore demonstrate to socio-ecologically minded investors the urgency for this clean, reliable and profitable technology in Hong Kong. We offer our collaboration with entrepreneurs who can look beyind the bottom line and respect planetary boundaries and social welfare.

IV. EXPECTED OUTCOME

Urban Terra Preta in conjunction with innovative social arrangements can be part of an integrated vision for resource management, local soil regeneration, agriculture and energy production. But Terra Preta alone is *not* the 'miracle cure' to solve our deeply systemic, environmental crisis. Therefore, Fermenting the City 城市在發酵 – focused on local relationships and individual empowerment – engages individuals and institutions alike toward practising a shared culture of closed cycles and ecological connections. Most of our social and environmental crisis can only effectively be addressed long-term by creating more vibrant, local economies – on the material and cultural level. To spread this message and give this project we will work toward the following outcomes:

1. Personal Empowerment and Behaviour Change: Becoming part and contributing first-hand to shaping the urban environment – no matter how small – is crucially motivating for daily practice and behaviour change. We expect that our 'education-through-action' approach in and around the Fermenting Stations (urban farms) and the resulting relationships will strengthen civic assertiveness and engagement in our participants. We believe that these those confident and diversely interrelated people are the agents of change.

2. Build up of Soil-based Urban Ecosystem Services in Progress: Informed and updated continuously verified by participants we will establish Organic Resource Flow Maps for the surrounding district of each Fermenting Station (urban farm). This coordinated effort that traces origin and movement of available plant nutrients will help us decide how to best carbonise and ferment these resources and where to allocate our urban farming capacities for the compost produced . We expect that the ongoing discussion among and beyond the Compost Alliance will lead to novel urban farming strategies and take shape wherever we let soil and plants do their magic.

3. Online Knowledge Base: The online knowledge repository will make Fermenting the City 城市在發酵 accessible to (international) audiences and could spur a relational debate on how we can make our cities more convivial and resilient at the same time. The peer-to-peer generated material will consist of manuals for grassroots composting, urban farming and resilient city life. It will also feature records from collective offline trouble shooting and the compost hotline.

4. Film Documentary from Fermentizen's Own Narratives: The act of fermenting plant-based materials means that we redirect and preserve vitality for future use especially in combination with the extreme buffer capacity and longevity of Biochar. Fermentation lets us experience the permeability of life and how humans are part of a consortium of social organisms mostly invisible to us. With these semiotic-philosophical aspects in mind, participants and their families will portray the project through personal stories and episodes within a short film production. The film will debut at the final exhibition and will be entered to short film festivals around the world.

5. Annual Report Courtesy of Compost Alliance: Transcripts from the film documentary together with essays from actors participants and observers of the project will be issued in illustrated and printed form. We also want to invite commentaries from urban planners, civil engineers, philosophers and entrepreneurs. This range of opinions will inform a well-rounded set of recommendations geared at public policy makers.

V. ENGAGEMENT STRATEGY

Composting is admittedly a rather 'foreign concept' for most Hong Kong-ites. Realistically our socially high-context framework with personalised compost consulting, offline educational events and online support network (see details in Work Plan) won't be sufficient motivation for some people to continuously sustain the separation and processing of their kitchen waste over time. Therefore, we will target Hong Kong-ites' weak spots for competitions, games and social media. To sharpen participants' senses and to elicit feedback in multiple ways, we plan to launch several more or less serious competitions over the course of the year-long project:

The Radical Greening Challenge: This competition requests from the 5 participating urban farms (Ferment Stations) to brainstorm and prototype creative ideas for the constructive use of compost in densely populated areas. The group effort is more than just urban space design but about social imagination and tactics. The compost mentors of each Ferment Station will lead the discussion on how soft power can make the urban hardware more permeable and life-affirming.

'My Ferment' Photo Contest (Facebook): We ask our composters to look for things that make fermenting intriguing to them and show it to the world. The images taken will be as important as the captions that goes with it. Over time participants will create a visual record on social media with their observations of the life residing inside their bokashi buckets and compost. It will be fascinating to see if and how this mediated presence will influence the daily composting practice.

Decorative Biochar: Waste-No-Waste: The biochar kiln on each Ferment Station allows to carbonise any kind of dried organic material up to a certain size. We invite participants to keep an eye on the biomatter around them and to collect and experiment. Fermentizens, Show show us how much beauty can be found in organic 'waste'!

Compost Medal of Honor: Keep composting and it will pay off. Together with all participants we will determine a balanced set of criteria to evaluate the performance of our fellow composters. Aside from quantity and quality of the compost and crops deliveredproduced, social skills and attitude will be also given strong consideration.

VI. ANALYSIS METHODS

In this ambitious undertaking we have four analytical streams of measuring the success of our activities and respond promptly in every phase of the process. We will keep track on Engagement, Contents, Life Cycle, and Public Health Criteria:

1. Engagement Analysis: Attendance sheets from live events (staff training, workshops, presentations, exhibitions) and user logs from website, social network sites and our phone app are instant indicators. Over time we also capture all email correspondence and build up a contact list of patrons. We record all help requests from the Compost Hotline. The Organic Resource Flow Maps will allow us to look at levels of connectivity inside the supply-&-demand chain of urban-born nutrients.

2. Contents Analysis: As for qualitative data capture, we employ contents analysis of selected Facebook pages, email correspondence and the online feedback form. The composter's Facebook contributions and messages will provide key texts for examination, including photos, videos and comments. In the concluding phase of the project, our in-person interviews with key actors will focus on how they engaged, interacted and participated in the Compost Alliance. Questions like how they first encountered the group, and what motivates them to be involved, and on what level of engagement. Relevant will be to find out if and how offline and online exchanges are influencing DIY composting practices. For live events we will provide evaluation questionnaires and seek follow-up conversation with participants. We are curious to find out for example if there are any correlations between the participants' lifestyles, compost practice and the resulting soil fertiliser (4. Public Health Criteria).

3. Life Cycle Analysis (LCA): Better integrated urban design in Hong Kong starts with moderating our ecological footprint within the tolerances of our technical limitations. We will rely on open-source software (like openLCA) to evaluate waste reduction and soil production and track the emissions and energy input throughout all phases. This includes water use and mileage from logistics and people's mode of transport.

4. Public Health Criteria: The fermentation performance of organic matter in bokashi and dry toilets can be easily moderated with DIY pH testers (dye indicator) to ensure that acidity has reached pH <4.0. To evaluate the biochemical contents of the compost material we will collaborate with a soil lab. The parameters for healthy soil are as follows: pH (5.5 – 8.5); Organic Matter (> 80%); C:N ratio (< 40); Total NPK (3-6%); Bulk Density (0.25-0.35 tons/m3); Microbial biomass and enzymatic activity. Regarding contaminants we aim at the following values: Salmonella (<3 MPN/ 4g); E. Coli (<1000 MPN/g); heavy metals; pharmaceutical residues (46).

VII. COLLABORATION NETWORK

The foundation for Fermenting the City lies in our personal and professional network that Wanho Tam and I have nurtured over the past years among local farmers, health-concerned citizens, ecology-minded friends, and an international group of natural and social scientists. There is a steadily growing interest for food security in Hong Kong providing a fertile seedbed for this education-in-action project to succeed. Any kind of development – even failures – from this emergent and distributed collaboration will deliver welcome learning opportunities and be of value to society at large.

Collaboration proposal for on-campus food 'waste' composting

Field experiment at Hong Kong University rooftop farm

Preceding the indigenous bokashi workshop (Turning 'Waste' into Gold) for the General Education Unit of Hong Kong University, the researcher together with permaculture practitioner Wanho Tam and friends formed the group Black Circle. When invited by university's rooftop farm to facilitate a guest workshop, Black Circle proactively created this proposal for a long-term, student-run composting initiative which was not realised.

BLACK CIRCLE 雲土間

Black Circle 雲土間 | *Markus Wernli, Wanho Tam, Hang Yu Fai* | *7F, 25-31 Kwong Fuk Lane, Tai Po, NT, Hong Kong*

Proposal for *Terra Preta* Black Earths practice at HK University

2 December 2015

General Education Unit, The University of Hong Kong
2/F, Pao Siu Loong Building, Pokfulam Road, Hong Kong

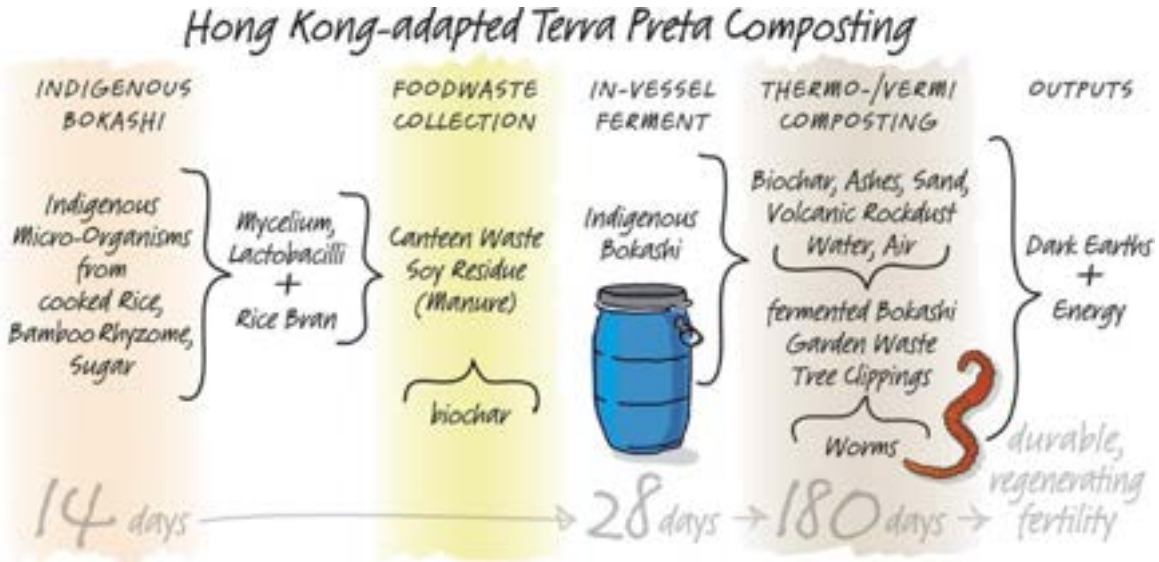
Objectives: HKU Rooftop Farm is already a collecting point for organic residues like eggshells, spent ground coffee and garden clippings from in and around the campus. This proposal aims to engage students in closing the nutrients cycle for fertile soils, and in an ongoing holistic learning experience. We are excited to co-create and sustain an exemplary, forward-looking compost concept. From our own, practical experience we advocate to implement the Terra Preta Black Earths method, since it is very adaptable to the specific needs of HKU Rooftop Farm and can accomplish the following:

- Expand capacity of sensible food waste and biomass recovery on HKU campus and nearby neighbourhood (toward a zero waste vision);
- Promote ecological and self-sufficient biomass conversion without reliance on energy input and machinery (use renewable resources instead);
- Utilize fermentation-based, in-vessel processing of foodwaste to minimise CO_2 emissions and odours while retaining (micro-)nutrients;
- Facilitate long-term soil fertility with improved nutrients, air and water retention;
- Co-create an aesthetically attractive, clean compost facility from recovered materials to minize ecological footprint;
- Deliver embodied learning opportunities by reconnecting students with their biological foundation (the living soil that is);
- Provide a social platform for the wider community in applied Permaculture, Terra Preta, climate farming, fermentation and biochar practice;
- Partaking in exchange opportunities of the interdisciplinary, international *Terra Preta* research network (knowledge update, biochar research, seed exchange, conferences, etc.).

Collaboration: Black Circle 雲土間 will assist HKU Rooftop Farm in planning the compost system and delivering workshops for General Education Unit. We see this opportunity as learning-in-progress where share the responsibility for the success of this compost initiative. Establishing a good communication will be crucial to review, respond and keep improving this concept. Success in composting comes from mutual investment and dedication over time, so we are interested in a more long-term collaboration.

Compost Set-up: *Terra Preta* Black Earths is a recently rediscovered resource cultivation method that produces fertile Black Earths from biomass fermentation and the addition of clean, high-temperature charcoal dust (biochar). The fermentation retains nutrients and minimises carbon dioxide emissions. The biochar mineralises these (micro-)nutrients, contributing to long-lasting soil fertility. Over the past year, Black Circle (雲土間) has adapted *Terra Preta* for the urban conditions of Hong Kong. It consists of the following five stages:

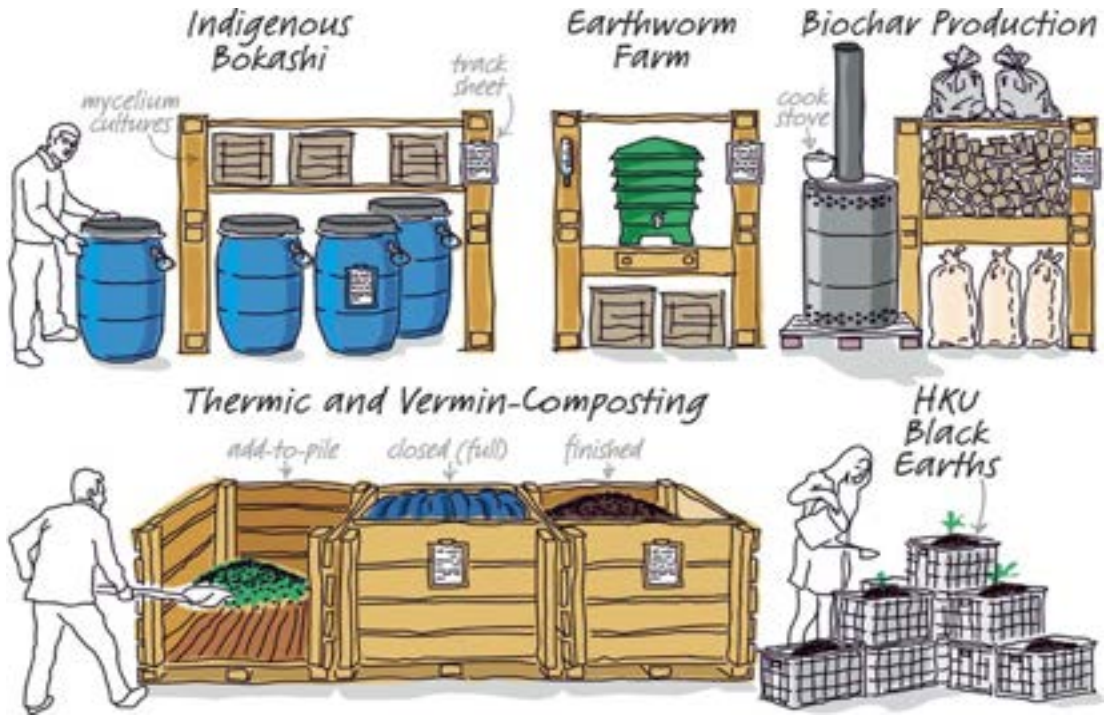
Urban *Terra Preta* composting					
Adapted and tested to the conditions of Hong Kong					
Stage	*Component*	*Input*	*Output*	*Time*	*Material*
1	**Indigenous bokashi**	rice bran, bamboo rhizome, cooked rice, sugar, water, food waste, soybean residue	fermented, preprocessed (stabilised) food waste (pH 4.0-5.5)	14 + 28 days	Bokashi rack with two 60L reactors, one 60L bedding barrels, wood crates for microbe generation
2	**Earthworm farming**	Red wiggler (*Eisenia foetida*), spoiled fruits, coconuts husk, soil, newspaper snippets	doubled worm population	28 days	Worm rack (sheltered) with storage for bedding material, pH dye indicator, and thermometer
3	**Biochar production***	wood waste (untreated), rice husks, used sugar cane	Durable, clean pyrolysis charcoal for soil amendment	1-8 hours	Rocket stove (200L steel drum) with retort (120L steel drum) and chimney, fire extinguisher
4	**Thermic and vermin composting**	fermented food waste (stage 1), garden residue, tree clippings, manure, biochar, ashes, sand (volcanic rockdust) + worms + water	Fertiliser	180 days	Triple compost bin with roof, soil thermometer, pH dye indicator, hay fork, plant clipper or shredder
5	**Fertiliser application**	substrate from stage 4 (ratio 1:5), mulching material	Reinvigorated soil		Shovel, wheel barrow
**) If biochar production is not possible on HKU Rooftop Farm, Black Circle (雲土間) can provide a limited amount of Biochar (黑匠) from own production at low cost. Alternatively we could inquire with Kadoorie Farm which operates a high-capacity pyrolysis facility.*					



Maintenance and monitoring: Upgrading foodwaste into good soils requires devotion and dedication throughout the year. To keep the microbes in fermentation and composting flourishing, human attention at least twice a week is required (for sufficient moisture and aeration). With the fluctuating student body and the short semesters in mind, we recommend the following instruments for adequate maintenance. To add a fun and 'cross-species' element, the instructions could be presented in the other-than-human perspective of soil microbes and fermenting bacilli:

Maintenance and Monitoring:

- Manual (weather-proof binder) with cheat sheets and annual composting calendar for each composting stage;
- Duty raster for bokashi generation, worm nourishing, and compost making;
- Tracking sheets for each compost stage to monitor and note the status of compost temperature, watering, pH value, etc.;
- Text messaging group with Black Circle members for remote advise *on demand*.



Workshops: The workshops at HKU Rooftop Farm with General Education Unit introduce students to the Terra Preta soil method. They can also be a way to help construct the compost station and rekindle the motivation throughout the year. Black Circle is competent to deliver these workshops:

- **Palette Wood Craft:** Manufacture attractive compost furniture (bins and racks) from recovered wood. Palettes are also useful for planter boxes, tables and benches.
- **Indigenous Bokashi:** Generate your own, beneficial microbes to effectively ferment and sanitise food waste. Harness the power of locally sourced mycelium and lactobacilli.
- **Biochar Magic:** This is ancient resource cycling wisdom and climate farming at its best. Learn how to produce your own high-temperature charcoal and help transform soil into a carbon and nutrients buffer.
- **Thermo & Vermi Composting:** Learn all about compost 'worm parenting' and how to manufacture precious soil from your food scraps within six months.

Timeline, Budget, Access to Tools & Materials: To be negotiated after discussing the viability and details of this proposal.

Thank you for considering this proposal. Your Black Circle 雲土間 *team.*

Urine donation log

Participatory installation *Aquaforming Mars!*

(folded sized DIN A5, open sized DIN A4)

On 5 January 2017 during the exhibition opening at the Korean Research Institute of Chemical Technology, visitors were asked to donate a 20ml urine sample for fertilising water-based horticulture to agroecologically support imminent settlement of Mars. To endow this interplanetary nutrients exchange with human values, participants were asked to forward a personal message to their vegetal offspring growing 54.6 million kilometres away from Earth.

Installation posters

Participatory installation *Aquaforming Mars!*

(Laserprint, DIN A1, 59.4 x 841 cm)

The posters were an attempt to contemporise agroecoligal knowledge through listing the biochemical constitution of urine, charting fermentation practice on Guattari's ecosophy spheres, visualise nutrients conversion in soil-less planting, and consolidate the interexistent metabolism of human animal, bacteria and plant on one timeline.

APPENDIX — CHAPTER 5

Horti-Ethnography

Emerging themes: What made persevering gratifying?

Participatory study *ANTHROPONIX*

The ethnographic account is composed of self-reported statements from the 22 study participants asked to explain why they remained active over six weeks in a technically 'lost cause'. Since social desirability in this in-group study may have influenced the results, they were not pursued for in-depth analysis.

Main themes	*Self-reported statements* [number of incidents]
1 - *relations*	**Belonging, loyalty, seeking recognition**
Relating to the group	• Finding collective monitoring life habits, fermenting and growing rewarding [3] • Finding a safe space to go beyond comfort zone (urine work) [2] • Mastering the unexpected together (initiation passage, happy accident) [22] • Investing materially in the subgroup to overcome problem (group purchase of airlock valves) [1] • Keeping in touch remotely after being hospitalized in middle of project [1] • Feeling obliged to group and restart growing after procrastination and lull (seeing efforts of others) [1] • Becoming self-made mentor and opinion leader in the group (influencer) [1]
Relating to facilitators	• Want to have own health concerns heard (cholesterol, diabetes) [2] • Disclosing something private (confiding toilet routine) [3] • Seeing interrelations with personal expertise (co-consultancy) [2] • Finding affirmation in explaining “The Chinese Way” (food, health, horticulture) [2]
Relating to biological world	• Finding companionship with plants: passage of life (and loss) together [1] • Seeking connection to plants and greenery as bridges to “nature” [2] • Finding surprise, wonder and inspiration in plants’ resilience [4] • Living in shared presence of fermenting bacteria: “you don’t control, you live with ferments” [1] • Intrigued to become a potential “parent” of plants [2]
Seeking endorsement	• Comes recommended by horticultural and mentors and biology teacher [7] • Finding reassurance in institutional support (funding) of this project [1] • Keen to obtain a course attendance certificate [3]
2 - *safety*	**Protecting wellbeing, defining boundaries**
Preventing harm	• Finding reward in monitoring diet and life habits [1] • Seeking more wholesome fullness from eating (improve eating habit) [2] • Desiring homegrown food due to mistrust for production methods of imports and preserves [2] • Aspiring to take up fermentation practice (natto) for probiotic health boosting [2] • Making own bodycare products (remedies, soap) as toxin control strategy [3] • Finding own urine more trustworthy than others’ [1] • Seeking organic, non-synthetic fertiliser (which are unpredictable) [3]
Eliciting health feedback from biological world	• Finding instant food validation feedback in one’s human waste [1] • Approaching urine as human health indicator [2] • Getting instant food validation feedback in one’s human waste (instant food validation) [2] • Finding meaning in bringing metabolic input and output in direct relation (eating & growing) [2] • Intrigued by plants as indicator of human health (speculative) [1] • Discovering how one’s eating is affecting the plant’s health (consequential revelation) [1] • Staying in contact with biological exchanges on multiple levels (air, water, nutrients) [2]
Containing, processing and purifying	• Going through trouble to repackage the leaking urine tubes with heaps of tape and container [1] • Insisting to keep processing of human waste clean and hygienic (“civilised way”) [22] • Brewing one’s own tea instead of drinking plain water [1] • Preferring quick expelling of toxins and residues [2]
Aspiring to personal ideals, maintaining integrity	• Keeping one’s promise of commitment (self-accountability): “I never quit” [1] • Being different by doing the unconventional (“positive notoriety”) [4] • Being convinced to adapt to problems and to persevere (we are resourceful, not helpless) [1] • Being confident in plant raising and fermentation before going into project (veteran’s advantage) [1] • Desire for homegrown food to avert ethically troubling food miles [1]
Following personal principles or school of thought	• Being more health-conscious food consumer than others in Hong Kong [1] • Feeling obligated to family tradition of fermenting/composting: “keeping things together” [2] • Building on established fermentation practice and maker ethos (‘fermentizen’) [2] • Pursuing practice of critical consumption (anti-consumption, DIY ethic, simple living) [2] • Identifying with pursuit of permaculture design principles [3] • Identifying with pursuit of regenerative food production (soil beneficial growing) [1]

Main themes	*Self-reported statements* [incidents] Emerging themes: What made persevering gratifying?
3 *- competences*	**Taking embodied action**
Taking ownership, doing it my way	• Intervening with creative fix, being resourceful (together with husband) [1] • Yearning to appropriate and complete the procedure to one's own specs: "I do it my way!" [1] • Adopting journal as scratch book, research index, game plan, springboard, chronicler [3] • Thoughtfully arranging/staging fixtures in photo self-documentation (representation autonomy) [1] • Finding gratification in home cultivation of compost and plants (self-providing) [3] • Being too lazy to buy fertiliser and resort to haphazard urine utilisation [1]
Indulging in the sensory	• Practising mindfulness in daily routines: "don't think when you do, just do" [1] • Finding comfort in one's own animality (eco-interrelatedness) [2] • Deriving mental wellbeing [healing] from plant growing: "watch them grow" [3] • Finding self-expression and mental escape in vegetal "microworld" [3]
Interfacing with the biological world	• Being captivated by sensation of biochemical reaction in the ferment: it's alive! [22] • Demanding hyper-mobile, compact planting method [2] • Finding satisfaction in the sensory/emotional experience of fermenting and growing [2] • Rediscovering fermentation as simple, easy and neat practice ('enzymatic affordances') [2] • Feeling assured after receiving prompt explanatory reply in uncertainty (suspicious earthy smell) [1] • Appreciating illustrated instructions for seed germination [1] • Relishing in the Aroma Chart to track smells of urine ferment [1] • Appreciation for aesthetics of urine and plants in clear tube and fixture design [5]
4 *- curiosity*	**Purely discovering, learning stuff**
Becoming implicated in biopedagogics	• Learning that crosses through everyday life: "from fridge to bed to toilet to window" ("camp learning") [1] • Don't want to miss out on progress or knowledge (workshop instalments) [1] • Inspired by 'multimodality' of combined relation/meaning/science presentation of workshops [1] • Finding meaning in re-contextualizing tradition ('night soil') with contemporary [1] • Learning at moment of breakdown or failure (I don't give up) [1]
Obtaining and validating knowledge	• Seeking knowledge update on hydroponics technology [3] • Resonating with agro-scientific research interest (bacteria interactions) [3] • Exploring an alternative way of growing plants [2] • Obtaining lesser known knowledge (like Soil Respiration or MIC of fertiliser production) [1] • Inspired by fermentation as "lazy, fireless cooking" for urban dweller (life-hack) [1] • Want to see the outcome of 2.5 years of fermentation research in Hong Kong [1]
Learning together	• Seeking eavesdropping opportunities as introvert learner [1] • Tapping into ideas and a shared knowledge base (recipes, trouble shooting, multitude of responses) [1] • Learning from mistakes of others [2] • Finding accelerated learning in the group [2] • Trying and feeling out 'eco lifestyle' in a group [1] • Passionate about 'citizen science' opportunity [1]
Growing as person	• Growing confident by negotiating (defending) project at home [4] • Discovering how one's eating affects environmental health (consequential revelation) [1] • Drawing connections to existential questions of life (growing from seed) [1] • Moderating expectations when things don't work well: Relax, take it easy and let it go [1] • Recapping one's own development (as horticulturist) by witnessing novices (Joan's root hairs) [1] • Deepening own physiological research: how does urine relate to sleeping patterns? [1] • Aspiring to the level of project organisation (model of dedication) [2]
5 *- Contact*	**Engaging with the precarious**
Encountering the incomplete	• Speculating about endemic marking of 'fermentizen' lifestyle in urine: What essence of me is urine? [1] • Intrigued by abundance of growing and pathogen potential of urine (life and death) [1] • Attracted by undetermined outcome (curiosity) [1] • Being part of something daring (human waste taboo) [1] • Finding relevance for Hong Kong in this "social experiment" (privilege of failing) [1]
Wayfaring with surroundings	• Demanding hyper-mobile plant-growing system for instable home environment [1] • Pushing the project despite skepticism and resistance from family [3] • Engaging mom to pick up seed supply from researcher's office [1] • Pursuing project as an undercover mission ("experience first, tell about it later") [1] • Popping the question: would you rather drink your urine or the hydroponic solution? [2] • Keeping the boundary and integrity of cohort subgroup [1]
Confronting inner tensions	• Bewildering second thoughts on eternal feedback loop of drug consumption (plant/human/plant) [1] • Experiencing health-related anxiety related with urine test [Ho WaiMei] • Experience closeness and vulnerability with plants (aeration as 'human to plant resuscitation') [1] • Relating growing experience with inner conflict of the past (depression & drug history) [1] • Entering this doubtful venture against better judgment (akrasia): "I knew it wouldn't work" [1] • Dwelling in unknown territory, respond to problems: suspense in the incomplete [2] • Stay engaged in unsettling practice: is growing in tight tubes plant-friendly? [1] • Waiting for more efficient growing system to arrive (anticipatory procrastination) [1]

Differing from societal norms	• Taking back control over my "own nutrients assets" ('nutrients autonomy') [1] • Willing to pay extra fee to have human waste recycled processed into soil amendment [1] • Criticizing allocation of public resources: "we waste too much on waste" [1] • Using the underused instead of buying stuff: preserving urine = nutrients + water resource [1] • Regain self-determination over time: "why work overtime when I can make my fertiliser or toothpaste?" [1] • Exemplify ways of environmentally sensible lifestyle that "you don't have to buy into" [1] • Demanding to rethink our situation and conventions practically [1]
Feeling obligated to 'greater good'	• Assuming the journal entries are valid research data for investigator [1] • Hoping to contribute to a project legacy ("toward better future") [1] • Returning the favour: we took it somewhere, it should go back there (waste-in-need) [1] • Demanding to demonstrate the usefulness of human waste in current context [2]
Charting out futures	• Sharing the mission of "reconnecting people and waste" (moral education) [1] • Envisioning byproduct reuse as creative industry in Hong Kong [4] • Wanting to bring more green into the "concrete jungle" (DIY recirculation window farm) [1] • Preserving local food culture for restoring diversity of tastes and roots [2]
	Deterrents for particitation in study
Statements by study candidates	• Fearing that urine storage in shared dwelling is unacceptable for roommates [2] > safety • Mistrust toward ferments misconceived as food loaded with synthetic chemicals [1] > safety • Concern about inability to monitor and change eating habits [1] > potential failure • Unable to meet time commitment for workshops [1] > relation • Getting impression this research is very wasteful (time, seeds, effort): "people want to eat!" [1]

APPENDIX — CHAPTER 6

Rendered Analysis

Sociopsychological data tracksheet

Participatory study *ANTHROPONIX*

The data tracksheet was the instrument for evaluating the experiential journey of each journey by correlating all recorded verbal exchanges, material outcomes, organismic presence with self-reported statements/self-documentation (personal meaning-making), and typifying them on a scale of affective dynamics adopted from Gestalt research. Guiding questions were what factors help the individual to engage adversity (activation in failure), and what forms of validation encourage an individual to act socially. Here is a sample from one participant named Vincent.

DISPLAY OF AFFECTIVE DYNAMICS

Reactivity (disengagement) in Uncertainty (from fearfully exposed to numb detachment) ISOLATED STATES

exposed<	humiliated<	overwhelmed<	confused<	defensive<	**>bored**	>desensitised	>unfeeling	>dissociated	>numb

Engagement with Uncertainty (from sentimental-touched to unfeeling-impersonal) INTEGRATED STATES

intimate<	excited<	pluriversed<	engaged<	situated<	**>mental**	>analytical	>logic	>strategic	>rational
		Self/other-aware							

V I N C E N T (37)

DAY	***SITUATION GIVEN***	*Factors of un/certainty*	***PRESENCE EVIDENCED*** ***of measured degrees of presence (self-other awareness) combined with vulnerability***	***TRUST:*** ***What influences person's consciousness?*** ***Particularised Knowledge:*** ***. bodily information*** ***. shared secrets*** ***. vulnerability awareness*** ***. shared humility (failure)***	***TOUCH:*** ***What coregulates person's grasp of reality?*** ***Attention to Other:*** ***. bodily services*** ***. private language*** ***. emotional support*** ***. correction of humility***	***TRANSITION:*** ***What moment trigger radical interdependence in a person?*** ***Autonomy Dynamics:*** ***. bodily sensation (emergence)*** ***. suspense in dialogue (dramaturg)*** ***. generative tension (precarity)*** ***. delib. risk-taking (courage)***	*Direction, Intensity and duration*	*Display of affective dynamics*
	Intake interview	Introduction via sound-artist friend connection	**. Striving for healthier eating and lifestyle;** **. Quest to reach higher consciousness** **. Sensibility for process** **. Self-other awareness as emergence** **. Relates bio-multiverse with his multiple persona (social integration)** I clicked into the questionnaire [application form] and then learnt that there is fermentation involved, which happens to become an interest of mine lately. My mother does a lot of fermentation. Also planting is something that I am trying to incorporate into my life and on my windowsill. Maybe these two [aspects]. I am in a kind of rehab mode because only since the past year where I kind of changed my lifestyle to this kind of freelance musician position. Back then I was doing like studio jobs in like a music studio… so those are some weird hours and also you know you just eat takeout for so many meals. It is only food really. So this year I kind of developed that… and kind of feel better. Because back then, no matter how much I eat, I still feel like I am a little bit hungry. But now, cooking at home maybe, like the whole process, maybe it slows you down a little but to find respect for the food. So there is something about that process. Because I do eat a lot, really fast sometimes in the past and you still feel hungry. It is kind a weird sensation. But now it is changing a little bit. Especially when I go to my parent's place to eat, more veggies make me kind of fill up easier. And then also I try to drink more water after the meal. That helps me feel like substantially full. I guess you are right that it is more a kind of a feeling. A psychological thinking too. [M: Do you tell others about your toilet routine, about what you see?] Mainly just between me and my girlfriend [laughing]. We make silly jokes, you know… We have a term like "coffee poop". Usually after we've had coffee, it makes you wanna go… [laughing]. Mainly just between me and her… I feel like I got multiple personalities like that [laughing]. I am more of an introvert, so sometimes as a musician you have to go out, and it is all with strangers. I sort of know that I sort of put out this personality. So I guess that is what I meant personalitywise. Whenever I am with people, I feel like I have to pretend to be more a social kind of…	The promise of new information (intricacies) is alluring. Confiding body information	Material pleasures of cooking How one relates to the world "coffee poop" as insider term	Disease and 'rehab mode' as opening Discovering the different qualities of appetite and relating to ones body processes Humour ('silly jokes') for sensitive issues Confession to be a "concealed introvert" Makes imaginative association of pluriverse microbiome and his multiple persona	2 hours open question interview	
01	Project start		**Helped in last minute project preparations (journal manufacturing)**	Gains behind-the-scene info of project organisation	Manual labour contribution	heightened curiosity or anticipation?	3 hours work session	

	Workshop 1		**Eager to learn details about prodecures, confidentiality and the biological relations** • Sorry, sorry, that's from the sauerkraut and then you added sugar…? • So we get the LAB from the sauerkraut and then using the lactoacid to ferment the urine? • So when you fill the cup, you should have enough to fill the tube twice basically? • This [the journal] goes back to you after these 42 days? • [one-on-one inquiry after workshop] on urban metabolism and nutrients cycle	Curiosity for particularised knowledge Seeks Bodily information in relation to environment Need for transparency on use and privacy of personal information	Definition of terms, shared language Put ones body in service of environs Provide safety and confidentiality Respect borders of person	(body language?) Generative tension between person and group Openness for possibility	>G: 5 discussion inputs >R: 3 inquiries	
02	2 April	Exploding urine cartridges	**Reporting back:** I did already [taping leaking tubes]. Really need some tape to keep it in place. But still some CO_2 leaking out!	Shared need and observation	Supportive language	Bodily sensation (eye, ear, skin)	> R: 1 SMS reply	
	3 April		**Insider talk** Great good to know they [lactobacilli] are thriving!	Insider feedback	peace of mind	Jovial exchange (sense of humour)	> R: 1 SMS reply	
05			**Request** If you are free can you send over the title of the fermentation book that was mentioned briefly on Saturday (the author's first name is Alex?)	Insistence to know more	Access to facts		> R: 1 SMS inquiry	
			Reporting back: Sad news - the day one tube was really working against the tapes. Drop off my hands as I try to fix it with more tape on it. 3/4ths gone ;(	Vulnerability awareness	Signals shortage	Bodily strive	> R: 1 SMS reply	
			Spoiled hands all good, smells more of the LAB solution than anything else	Shared messiness, condole	Seeks confirmation	Bodily sensation (more-than-human interaction)	> R: 1 SMS reply	
	Workshop 2	**Procedure breakdown;** ("reality check") > Popping lids, unreliable testers; labourious journal	• My sauerkraut is doing well. It put out the liquid and pushed through the metal lid… • Urine testing? Quiet difficult! • What [solids in inoculant] is in that bottle? • [Urinalysis] The colour. I didn't find the colour. It is like in-between shades or shades of green that I cannot detect. • Do we take our [urine] samples back home?	Self-evaluation with others	Prompted one-on-one interaction for the more introvert	Clearly discernible sensations provide clues and confidence, otherwise confusion	> G: 5 discussion inputs	
	Post-workshop	**Disagreeing group members on choice of seeds**	**Joyous injection:** Wha Me Eat Wednesday 'Watercress' by MackaB https://www.youtube.com/watch?v=KDtsYmoAuSo				>G: 1 SMS	
		Product breakdown: Popping tubes						
10	10 April	Inconclusive what to grow						
	11 April		**Openly shared observation** Hi Marcus, Was the LAB solution given this time somewhat less potent? For me, they seem to discharge much less CO_2 compared to the bottle from 1st week. The U tubes seemed to have improved too, i don't even need to tape mine.	Suspicion, hunch	Open up (reveal) experience	spontaneity	>G: SMS	
20	20 April		**Call for support** Uff… My watercress are really not doing so well. Seed planted on Day 8 onwards did not really sprout. Might have to go with the backup mung beans..	Vulnerability awareness Confiding	Use of vernacular		>G: SMS	
	22 April Workshop 3		**Nurturing aspects** [judging urine ferment aroma]: Hmm, alcohol… • You don't think the Urinalysis or Water Test strips will contaminate the urine or solution? • I ended up planting 2 seeds in one plug. [transplanting fragile seedling roots] I will be careful. (Benson) Wilmer actually brought a half cut PET bottle, for his very strong and healthy beans. The most healthy I have seen. So he has made in his own device, to protect the plant.	Confronts, engages with Vulnerability Far-reaching sensibility for influencers of fermentation process	Counteracts, mitigates, works with vulnerability Takes material pre-caution	Courage to transport fragile plants	> G: 5 discussion inputs	
		Complexity						
29	29 April Workshop 4	**Plant pathology** **Procedure breakdown** **Incomplete knowledge**	**Sharing concerns and eliciting support** • Planters are by the window. Some have not sprouted in these rainy days. And the ones who have sprouted in these few days don't really grow. There is some problems with the leaves: the tips are browning. But so far I didn't have an algae problem [points to Tony's planter where there is a lot of green on seed plugs]… • [pointing to Water Test strip] The free chlorine and the nitrite are always off the chart… • Is the reason why the second differs from the first Urinalysis test that the urine is diluted? • In ANTHROPONIX we are aiming for pH 5, is that right? • [growing solution] For making it stable or change what can you do? [Benson: Wilmer seems not to be willing to talk to people individually but he likes to speak in public…].	Rational measures are failing	Control measures are failing	Asking for input Unanswerable, open questions to drive imagination?	> G: 5 discussion inputs	
		(RE: Dora's and Ivy's automized air pumps)	**Comment** Nice pump!				>G: SMS	
30			**Sharing concerns and eliciting support** Hello fellow antrononix operators 各位苦棟粒對付真菌蚋有冇作用?家中泥有很多,可能影響我的新苗…. Anyone has experience combating fungal gnats? They are very active in my pot plants and I was okay with them but been thinking they could be affecting my sprouting seeds. Is Neem oil / or solid form of it effective? Thank you, have a nice long weekend ;)	Wants to confirm (particularised) knowledge	Describes and diagnoses occurrence (potential thread) Looks for shared experience	Reaches out for help	>G: SMS	
32	2-10 May	**Inexperience, incompetence**						

42	13 May Workshop 5	**Procedure breakdown;**	• [photo report] There is nothing special with me. I sew everything. I stored my urine in the dark bathroom. I wrote my notes in the living room. I also grew my plants. Then I was encountering the problem with the fungal gnat I think. That's what they call it. They fly around my place and I suspect that they infected some of the seeds so some of the leaves are brown. The new leaves are okay. I didn't take much time taking care of the solution toward the end but they seem to grow. • [bioreactor discussion] These kind of ammonia bacteria, are they naturally introduced through the air? So, if I just leave my test tube out so that it is exposed to air, would it allow for this kind of [mineralisation] process?	Seeks self-explanation by connecting insects with plant health	Shows modesty: plays down his experience in front of group. Comparison with others	Grasps and proactively engages with the concepts	> G: 5 discussion inputs	
47	17 May	**Non-delivering project**	[sends photos of beans] Yes they are the better one that sprouted. I sort of stopped at the week 2 planting process. We'll talk later	Shared humility: stopped action (but kept contemplating) Confiding indiscretion	Comparison with others	Reserves personal revelations for interview with researcher	>R: SMS	
47	**Exit interview**	Personal pathology Social pathology	[the social] Wilmer: Yeah, it feels like that. Yes, you get a strong sense like that with every week signing in a questionnaire and talk to other peers. You know everyone is trying to experience the same thing but they have different workarounds. So that part of exchange. you are here at the design school so you kind of working toward that principle of like 'making something work easier' for the consumer and whomever. But then I don't know... Does it need to be always that convenient? Sometimes I ask myself... . Like I get the sense that this project needs and wants to be very scientific and precise, but then as I participate in this I find out that there is no way for me to be precise with things like journaling. Then I don't like a science lab at my home [smiling]. So I can only get my best attempt toward that. Wilmer: We basically tricking this life form, giving it what it needs and then telling it to grow. It is like satisfying its biological desires and then tricking it to fruition. This is quiet weird for me. And this is all thought that I have in these five weeks. Like, wow, fuck this is weird. So I am very glad it triggered these kind of thoughts.			Liberates himself from (scientific) **perfectionism** and becomes instead open for his experience (Brené Brown) Ontological design: What are the trade-offs of convenience? Ability of perspective-changing and questioning what makes for worthwile living and dying of plants. Can there be an **ethics of plant raising** and what would it look like?		
47	**Exit interview**	Shared vulnerability Constant reaction as "scientific" Experimental mentality Experimental under scientific disguise?	M: You didn't feel like, I want to give up, this project is messy, poorly prepared, unsanitary...? Wilmer: Noooo! That's totally fine. In fact I was a little bumped out the second week when the solution [lactobacilli inoculant] is not as strong. [laughing aloud] I was like, why would you change this? Why not keeping it as a constant maybe...? In this week I was still thinking that this thing is really scientific and we are trying to keep everything at a constant. And there is a part in me thinking, I wish it would be as strong as the first one: we just tape it down, it is no big deal. It is exciting though like the first week, I remember, this is very new to everyone in the group. And then coming for the second week and then everyone is like... "Happy accident" as Benson would say it, and I really totally agree with that. M: So a mishap like that can turn into something positive? Wilmer: Yeah, yeah. Actually, it really is [in] the group where this works. It is a sense of some kind of common experience of overcoming common trouble. That's just nice. I guess, that still could happen in an online course. But it is hard, even with the WhatsApp group.	When heightened vulnerability awareness is being tricked	Sensory excitement to focus attention	Shared strive can be a graceful experience		
47		Frame of mind (Dorst?)	Yeah, I would easily see myself ten years ago thinking, oh, this is all mumbo jumbo and what the fuck is this? Weird stuff, yah. Now it just come to me that is just all natural process. It is like wisdom of the human race. Pretty beautiful. It persevered through all this time. Look, I would see my younger self turned down because you see fermented Chinese vegetables, this kind of pot or container. It looks primitive and with my upbringing, it is just considered primitive, dirty, probably not safe. So we make all these assumptions. So maybe packaging can change that image... But it shouldn't be. We come to this point now where this becomes such a foreign object where we have to add sweetener to it to introduce it back into our daily lives.	Finds appreciation (aesthetic) in alchemistic folk knowledge (of fermentation) that links generations		Dealing with the unsafe (DuBuis)		
47		Meaning-making of data is key (Lupton)	Regarding the Urinalysis, I guess, I go through, like a lot of other people, like asking myself, what are these values? I looked up the specific remedy thing the first few days and it was like jumping up. And it is weird because, on the sleeve of the journal you have a "normal" row. So that was very alerting. But later in, I feel more like, I don't need this strip to tell me if I am okay. If I look, what the fuck I ate the other day, I would probably know. The pH might have changed a little bit, more of the colour that I noticed. After I opened the fermented ones I could really smell the difference.		Bodily authority	Direct bodily-sensory confirmation outperforms tracking instruments		
47		Autonomous thinking Liberation spirit Beauty of folk knowledge as liberation	M: Does such processing make sense on the individual level? Shouldn't we wait for the government? Wilmer: Ah, you can't wait for the government! I am done with the government. Government... I am talking about this neo-liberal government. Like this kind of full control stuff. This should be organic I think. Wilmer: Basically I think... of the people that I surround myself with now... I kind of surround myself now with people who can provide me the courage to say no to things that were forced on to me. Something like government. Like all this bullshit with like trying to push culture with the West Kowloon district while at the same time like really targeting one live house in the Kwun Tong district... It is a matter of like gathering people who are nifty and know how to use all this stuff against that. And basically create and pave your own path. Yeah. These are kind the frustrations or experiences I have had of living in Hong Kong that drive me to this kind of interest of like finding out what agriculture is. These are kind of informing my frustration with living under this kind of governance. Or this idea of... you know, just let the government do it, they would start it. I think more of this idea of magnets I guess. [centre of gravity]		Discovery as material process?	Autonomous designer: when frustration meets collective imagination get people activated?		

47		What kind of Imagination is sparked? What spurs original thinking? finding answers to most fundamental questions, particularly those surrounding life and death.	The urine I can see myself diluting and using for the pot plants. But the hydroponic thing… I don't feel good continuing them… It's like growing Frankenstein in tubes or something… this workshop where you talk about the dichotomy of the "plant brain" [plant/soil interaction] and the person's body and how it is like an inverted human being, where the brain is beneath [the ground and in the invisible roots]. This is really fascinating. It makes me ponder and imagine. So this is the idea of keeping the plant, the house plant as a pet as a past time… Yeah, like we said, it [the plant] is a life from of its own. … They have their own fate almost, their own life that it seems so… that maybe I am not that much important for them. What's cool with this [journal] is that it starts your imagination like a lot of the content of this project for me. Like it just sparks your imagination for me. That's the way I chose to work with this…		Bold association as materialised language Material services: we can be more than passive takers of life (eaters), and be givers of life as well (feeders).	Dialectic science-aesthetic juxtaposition as imagination trigger: the idea of **autonomous life forms** (value and meaning-making on their own right) To live Imaginatively is a choice?		
47		Contribution to the course of humanity	But this [ANTHROPONIX project] is really nice because you are exploring something that is really concrete. And for what I do as a musician it is like always to question myself: how does this help change humanity? I really, really appreciate this very practical, hands-on material use and then application.					
		Reconnecting to the living, the existential, the unexplainable. Sense of wonder, even in the unexpected Mortality as natural progression in a "world of eaters" (DuPuis): Eating and being eaten. Is that part of an adventurous "agroecological awareness"?	M: Isn't that scary though? Because what we are really talking about is processes of renewal, growth, life and decay… it comes down to our own mortality… Wilmer: But I mean, better to know that you are dealing with this, than to just kind of avoiding it, or not really acknowledging that it is happening around you, right? I think that it is very nice that you, for me at least, that the workshop kind of triggers that. And that sense of wonder of what's happening in and around us. I don't know, okay. I hesitate to share this, but I should. I am always like a depressed person. I have to go to like a psychologist and take pills and that kind of shit. But that was like years ago. Prozac and all that kind of stuff and antidepressant and stuff. But I stopped like three years ago. And I always trusted in that medicine stuff thing, even though in the back of my head there was a part in me skeptic about that. So I have been getting better these couple of years. But that sidetracks to another story where I got myself interested in these psychedelic drugs. I finally had like LSD earlier this year after so much talk hearing people and then, I don't know, that clicked something in me and in my life I think. I still don't know how to put in words yet. But it kind of gives me an experience where I experience things, or think about things a little bit differently. Of what I eat… like if I eat something then something might die, and so be it [laughing]. I have this likeness maybe in me. That's all maybe a natural progression of why, ah, this is really nice, there is something in this project that really peaks my interest. I am still more interested in this fermentation thing. I just have to go do that more. How that is similar to this kind of human culture building thing. And then how this kind of black magic and suppressed knowledge and then like ancient wisdom stuff… Alchemy, almost yeah. And music, a lot for me is like that. This kind of experience thing. You can't put it in words. It is very mystical thing. And for me fermentation and the whole process is kind of a bit like that.	Confront mortality rather than avoid it (vulnerability awareness) combined with a sense of magic in the process (Hitchings?) Recover suppressed knowledge				
47		Inspirations rather than change	. It [the project] gives me a lot of starting points I guess. Definitely a lot more starting points than before I started. Like this fermentation thing with Virginia and Sophie. Also interested to take a look in Shing's farm if it is available. Like I am in the process of taking small steps basically of kind of reviewing of what I can do with my existence in the city. This is just kind of knocking on doors for me. And getting perspective of how people use their knowledge or how they incorporate into their lives so. Yeah, try stuff and find people with common interest… yeah… and that is culture, living culture I think.		**Trying stuff (social experiment) as means of living culture**			
	SUMMARY		**Project triggered existential sentiment and ethical concerns beyond project duration**	**Fermentation Novice makes failing project into more open-ended existential and imaginative inquiry** **Engagement: 47 days. Status: Ongoing personal significance** Group input: 24x; Researcher text interaction: 9x; + journal prep session: 3 hours				SUMMARY
				**Rather than avoid uncertainty (that comes with dwelling in a world of mortals), we can engage the process with a sense of ethic and magic.**	**Use value here derives from creatively readjusting goals. In this notorious instability, it is okay to sink with the entire boat and along the path gain new perspectives and insights…**	**The 'pluriverse journal' (human-ferment-plant interactions) offered a "jumping board of the imagination", a possible dramaturgy of the self that is enmeshed in life processes.** **This participant purposefully engages imaginatively with this project.**		
50				**. Striving for healthier eating and lifestyle;** **. Quest to reach higher consciousness** **. Sensibility for process** **. Self-other awareness as emergence** **. Relates bio-multiverse with his multiple persona (social integration)**			The journal as jumping board of the imagination	

Description of motivation/outcome integration

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The findings from the data tracksheet were comparatively analysed with aspects identified by relational motivation research and for each participant described in a profile that integrated motivational characteristics with observable efforts and outcomes.

VINCENT (37)	
1.1 · Motives in relational goal pursuit (relationally-autonomous reasons, RARs)	
Accountability	HIGHLY RELEVANT: SUCCESS REDEFINED (INTERNALISED) AS SELF-DISCOVERY When achieving the original goal of growing plants failed, Vincent found use and contribution value in journal keeping – what he calls "reflective springboard" – for gaining personal clarity (awareness). He declared this an imaginative achievement and attributed it to project and facilitator.
Direct involvement	VERY RELEVANT: FACILITATOR-DEPENDENT DIALOGUE (INDIRECT WITH PEERS) Mostly during the extensive and confessional conversations in privacy with the facilitator where Vincent finds his voice and where he is fully engaged. As self-declared introvert, just being in the presence of peers and "eavesdropping" is more valuable (belonging) for Vincent than the direct exchange.
Shared values	MOST RELEVANT: VULNER-ABILITY ETHICS. As mid-aged artist in 'detox transition' toward a more health-conscious life, fermentation is seen as form of contemporised folk wisdom and an intriguing proposition. Trying to reconnect people with their biochemical foundation in the context of increased agroecological disconnect and control strikes a strong philosophical chord in Vincent.
Mutual support	VERY RELEVANT [COGNITIVE+EMOTIONAL+FUNCTIONAL]: SHARED SENTIMENT AS MEMBER In the face of procedure breakdown, understanding the underlying reasons for this project and the wider implications were more important than being fixated on horticultural problem solving. Feelings of reward simply from cognitive input and acceptance as temporary member in a one-off learning venture.
Closeness	VERY RELEVANT: CONFIDANT RELATIONSHIP (VOLUNTARY RISK-TAKING) Introduced through a mutual artist friend, Vincent and facilitator had an instant affinity for each other (around spontaneity and experimentation in everyday) that permitted collegiality and trust throughout the project.
[goal domain]	Health improvement and lifestyle adjustment
[integrative trigger]	Someone close to participant who knows the facilitator thinks these relational goals are enjoyable.
1.2 · Motives in self-cohesive goal pursuit (personally-autonomous reasons, PARs)	
Curiosity	VERY RELEVANT: DESIRE TO ATTAIN SKILLS, SENSIBILITY TO EXPLORE SELF
Achievement	NOT RELEVANT
Personal growth	VERY RELEVANT: LIFE LESSONS + ETHICAL REFLECTION
Recognition	NOT RELEVANT
Awards	NOT RELEVANT

2 · Experiential journey across motives	**3 · Goal efforts recorded**
FROM SELF-IMPROVEMENT TO VULNER-ABILITY TO SHARED NARRATIVE: What started out from an interest in moderating eating behaviour and exploring fermentation, became an inward, reflective journey of self-acceptance, and life purpose in relation with others (personal growth). It was a quest to grasp the larger, encompassing narrative of environmental mastery ("Frankensteins in tubes") and precariousness of human existence. Through the generous sharing at the end of project, Vincent's goal pursuit shifted from individual gain (PARs) to integrating a shared narrative and accommodating the facilitator's interest (RARs).	Vincent, like others, stopped actively growing plants in week four. After that witnessing the struggle of his plants made him reflect on what makes for a worthy, affirming existence across life forms. The multimodal journal triggered this emotional work which cumulated into a two-hour confessional sharing session with the facilitator. Strongly resonating, Shared Values, together with Accountability and Closeness to facilitator made the precariousness meaningful in relationally-autonomous ways.
Personally-autonomous reasons progressed into relationally-autonomous reasons.	RARs' predictors: **shared values –> direct involvement (F) + closeness**; (accountability; support;) PARs' predictors: **curiosity + growth** CRs' predictors: N/A. Group contact: 24x; Facilitator contact: 10x; Workshops: 5; Engagement: 47 days (active 32 days)

4 · Goal outcomes	**5 · Summary**
DISCOVERS INDIVIDUAL PURPOSE IN CONSCIOUS-EXPANDING LIFE EXPERIMENT **Progress:** Precarity shifted engagement from partaker to conscious thinker and conversation partner. **Attainment:** Precarity helped sharpen a sense for what did not work and ethical criticality. **Affect:** Precarity was affirmative for recent path taken in self-healing and life-improvement. **Goal Domains:** Precarity helped sharpen focus on life quality (health) and authenticity (self-improvement).	OUTLIER: WELL INTEGRATED + EUDAMONIC MOTIVES. INTERNALLY ADVENTUROUS. Precarity made Vincent dare to confess the emotional tensions triggered by the experience of dying plants ('planticide'). Personally, after the facilitator's imperfectness became obvious, Vincent could show his vulnerability too.

Experiential concerns side by side (1)

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The concerns that guided participants in the turbulent collaboration deriving from the experiential tracksheet and motivation/outcome description were then comparatively compiled as the departure point for sociopsychological analysis, *integrative autonomy* chords, and *adventure renderings*.

Comparing participants' concern vis-à-vis uncertainty (1–9 of 18)

NAME (age) Sex	Cella (28) F	Vincent (37) M	Mike (44) M	Bjorn (56) M	Teresa (58) F	Karmen (46) F	Wilma (46) F	Nancy (48) F
[occupation]	[biologist]	[musician]	[exhibit designer]	[highschool teacher]	[herbalist/retiree]	[green life advocate]	[soap maker]	[landscape manager]
RELATIONAL PREDICTORS (RARs) (order of importance)	1-**Involvement** (P-f) 2-Accountability 3-Support 4-Values 5-Closeness	1-**Shared Values** 2-Accountability 3-Involvement (F-p) 4-Closeness 5-Support	1- **Involvement** (P-f) 2- Accountability 3- Support 4- Values 5- Closeness	1- **Involvement** (P-f) 2- Support 3- Closeness 4- Values 5- Accountability	1- **Involvement** (P-S-f) 2- Closeness 3- Support 4- Accountability 5- Values	1- **Accountability** 2- Support 3- Involvement (F-p) 4- Closeness 5- Values	1- **Involvement** (P-f) 2- Support 3- Closeness 4- Accountability 5- Values	1- **Accountability** 2- Closeness 3- Support 4- Involvement (P*-f) 5- Values
Transpersonal Reason for Goal Pursuit	Pursue same goal as facilitator and we both enjoy it.	Someone close thinks this goal is enjoyable.	People involved make it fun and enjoyable.	People involved make it fun and enjoyable.	Someone close thinks this goal is enjoyable.	Strengthen a relationship with a close person.	People involved make it fun and enjoyable.	Goal is important to me and someone close.
Goal Domain	WORK (relational)	HEALTH (self-improve)	WORK (functional)	TRAIT (attribute)	LEISURE (learning)	WORK (networking)	WORK (intelligence)	LEISURE (functional)
Success Rationale	Collective Growth	Self-Discovery	Tangible Outcome	Tangible Outcome	Learning Opportunity	Public Legacy	Teachable Moments	Tangible Outcome
Involvement Type	Enjoying Company Co-Learning (peers) Advising (F)	Confabulating (facilitator)	Co-Learning (peers) Co-Amending (peers) Advising (F)	Self-Excusing (peers) [shaming]	Co-Learning (peers) Co-Amending (peers)	Confabulating (facilitator)	Mentoring (p-F)	Servicing (subgroup)
Shared Value	Agroecological Turn Hortophilia (practice) Fermentizenship	Existential Ethics/ Contemporise Folk Wisdom	Circular Economies/ Bottomup Industries	Agroecological Turn/ Maker Culture Ideals Fermentizenship	Agroecological Turn/ Hortophilia (practice)	Pro-environmental Activation	Anti-Consumerist Counterculture/ Bottomup Industries	Hortophilia (practice)
Reward Type (support)	Enthusiasm (peers)	Shared Imagination	Shared Struggle (peer)	Sounding Board (peer)	Shared Struggle (P-S)	Facilitator's Attention	Steering Decisions	Subgroup Cohesion
Relation to Peers	Partnering (agential)	Informing (tokenist)	Delegating (agential)	Pacified (tokenist)	Partnering (agential)	Informed (tokenist)	Influencing (agential)	Informing (tokenist)
Relation to Facilitator	Advisor (agential)	Confidant (agential)	Collaborator (agential)	Client (tokenist)	Student (tokenist)	Student (tokenist)	Advisor (agential)	Student (tokenist)
PERSONAL PREDICTORS (PARs) (order of importance)	1-**Curiosity** 2-Achievement 3-Growth	1-**Curiosity** 2-Growth 3-Achievement	1-**Achievement** 2-Curiosity 3-Growth	1-**Curiosity** 2-Achievement 3-Recognition (extrins) 4-Award (extrins)	1-**Curiosity** 2-Achievement 3-Growth	1-**Achievement** 2-Curiosity 3-Recognition (extrins) 4-Growth	1-**Curiosity** 2-Recognition (extrins) 3-Achievement	1-**Achievement** 2-Curiosity 3-Recognition (extrins) 4-Growth
Curiosity Type (excited to know)	Novelty Seeking/ Peer Response	Knowledge acquisition (fermentation)	Knowledge acquisition (renewable planting)	Novelty Seeking ('urine growing magic')	Knowledge acquisition (nontoxic planting)	Novelty Seeking/ Peer Response	Knowledge acquisition (latest hortitechnique)	Knowledge acquisition (water-based planting)
Achievement type	Work inspiration (algae reactor)	Self-Healing (detox affirmation)	Work instrument (DIY deodourant)	Trait affirmation (maker identity)	Leisure continuity (learning pleasure)	Work inspiration (social impact)	Superiority (know it better; gain farm intelligence)	Leisure instrument (system trial, eating monitoring)
Personal Growth	Failure Tolerance; Merit of experimental learning	Life Story Integration	Failure Resilience	Awareness of self-surrendering tendency	Failure Resilience	Awareness of value-action gap ("fast life")	Merit of experimental learning	Awareness for limits of self-sacrifice
Recognition	n/a	n/a	n/a	Approval from local fermenter group	n/a	Impact of venture's legacy on public	Appraisal of own expertise (need to be right)	Display of diligence, nurture and altruism
Awards	n/a	n/a	n/a	Instant Gratification (urine self-tracking)	n/a	n/a	n/a	n/a
Journey across Goal Motives	RAR > PAR > ***CR*** > RAR RAR: Us-Goal PAR: Me-Trait >CR: Me-Fix (blame) RAR: Us-Narrative	PAR > PAR > RAR PAR: Me-Goal PAR: Me-Narrative RAR: Us-Narrative	PAR > RAR > PAR PAR: Me-Goal RAR: Us-Goal RAR: Me-Trait	PAR > RAR > ***CR*** PAR: Me-Goal RAR: Us-Goal >CR: Me-Loss (shame)	PAR > RAR[S] > RAR PAR: Me-Goal RAR: Close-Relation (S) RAR: Us-Goal	RAR > PAR > ***CR*** > RAR RAR: Us-Relation PAR: Me-Narrative >CR: Me-Fix (guilt av.) RAR: Us-Narrative	RAR > PAR > ***CR*** > RAR RAR: Us-Goal/Relation PAR: Me-Goal >CR: Me-Loss (hiatus) RAR: Us-Narrative	RAR > PAR > ***CR*** RAR: Us-Relation PAR: Me-Goal >CR: Me-Loss (numb)
Guiding Concern in Precarity (= acute inefficiency)	Peers' Welfare (venture deliverables)	Life Conduct *(Dasein* contemplation)	Peer Symbiosis (combine efforts)	Self-Pity (own plight)	Venture Legacy (next phase)	Life Conduct *(Dasein* contemplation)	Venture Purpose Peers' Welfare	Underperformance anxiety
Goal Efforts	033x group contact 009x facilitatr contact 100% workshop (5) 042d engagement 032d task-active state ~~homevisit~~	024x group contact 010x facilitatr contact 100% workshop (5) 042d engagement 032d task-active state ~~homevisit~~	068x group contact 025x facilitatr contact 100% workshop (5) 089d engagement 042d task-active state ! homevisit	025x group contact 007x facilitatr contact 080% workshop (4) 042d engagement 014d task-active state ~~homevisit~~	013x group contact 001x facilitatr contact 100% workshop (5) 042d engagement 032d task-active state ~~homevisit~~	015x group contact 012x facilitatr contact 100% workshop (5) 042d engagement 022d task-active state ! homevisit	036x group contact 003x facilitatr contact 060% workshop (3) 042d engagement 022d task-active state ! joins Felix' farm visit	017x(+)*group contact 003x facilitatr contact 100% workshop (5) 042d engagement 042d task-active state ~~homevisit~~
CHANGES IN GOAL OUTCOMES								
Demand on Venture	Collective Reward (learning outcome)	Expand Self-Consciousness	Hortitechnic Solution	Hortitechnic Solution	Hortitechnic Training	Collective Reward (social change)	Hortitechnic Solution	Hortitechnic Solution
Progress	Hedonic > Transpersonal > Eudemonic	Hedonic > Transpersonal	Hedonic > Transpersonal > Hedonic	Hedonic > Transpersonal > Emotional Surrender	Hedonic > Transpersonal > Eudemonic	Transpersonal > Emotional Correction > Eudemonic	Transpersonal > Emotional Surrender > Eudemonic	Transpersonal > Hedonic > Emotional Surrender
Attainment (skills, virtues)	Reflection, failure resilience, sentiment	Reflection, ethical criticality	Leadership, failure resilience, humour	Failure resilience, patience	Teamwork, adaptability	Awareness, gratitude, failure resilience	Mentoring peers, coaching facilitator	Perseverance, dedication
Affect (wellbeing)	Integrated, with short discomfort discharge	Integrated, affirmation of self-healing	Well integrated, self-concordant	Less integrated, controlled motives	Well integrated	Integrated, assertion of inner conflict	Integrated with latent rivalry (compensation)	Integrated with self-betrayal tendency
Goal Domains	Health > Work	Health > Self-Improvement	Work > Self-Improvement	Trait (maker) > Trait (exposed)	Leisure > Relationship (S)	Work > Self-Improvement	Work > Trait (dominant)	Leisure > Relationship > Self-Improvement
SUMMARY	AVERAGE	OUTLIER	AVERAGE	OUTLIER	AVERAGE	AVERAGE	OUTLIER	OUTLIER
Comments	Highly transpersonal motives and ideals with limited failure acceptance	(self-revealing)	Transpersonal goal pursuit for highly self-determined motives	Transpersonal goal pursuit for controlled motives	Highly transpersonal motives and cooperation	Transpersonal goal pursuit for controlled and beneficial motives	Appeal on trait triggers transpersonal motive (return to exit interview)	Loyalty to close cohort triggers transpersonal motive for personal recognition
Vulner-ability & assertability (Keywords)	Inclusive-cautious, 'relationally rational'	Confessional, risk-taking	Unconditionally invested	Anecdote, alibi, conditional	Long view, strategic	Inner tensions, lofty ideals, guilt avoidance	intelligence mission, 'relational rivalry'	Self-sacrifice, sacrificial isolation, tactical
Homemaker Type	*Bioscience homemaker*	*Existentialist (Dasein) homemaker*	*Foodpreneurial homemaker*	*Unsettled homemaker*	*Remedial homemaker*	*Advocating homemaker*	*Rebellious homemaker*	*Devotional homemaker*

ACRONYMS:

RARs = Relationally-Autonomous Reasons; **PARs** = Personally-Autonomous Reasons; **CRs** = Controlled Reasons; **x** = times of verbal contact; **d** = days of engagement; **P(p)** = peers; **F(f)** = facilitator; **S(s)** = Spouse; **(+)*** = WhatsApp subgroup of Nancy, Oscar, Igor, Becky and 2 more

Quality of relations = Levels of Engagement (Arnstein, 1969): **Agential:** Controlling; Influencing; Delegating; Partnering. **Tokenist:** Pacified; Consulted; Informed. **Abandoned:** Treated; Manipulated.

Experiential concerns side by side (2)

Participatory study *ANTHROPONIX*

Comparing participants' concern vis-à-vis uncertainty (10–18 of 18)

Jyll (43) F	Felix **(32) M**	Becky **(22) F**	Igor **(23) M**	Titus **(58) M**	Helga **(48) F**	Eliza **(24) F**	Oscar **(39) M**	Clemens **(28) M**
[permaculturist]	[aquaponics farmer]	[ecology student]	[ecology student]	[retiree]	[hobby gardener]	[nurse student]	[ecologist]	[self-taught farmer]
1- **Involvement (P-f)** 2- **Support** 3- **Accountability** 4- **Values** 5- **Closeness**	1- **Involvement** (P-f) 2- Accountability 3- Support 4- Values 5- Closeness	1- **Accountability** 2- Involvement (p*-f) 3- Closeness 4- Support 5- Values	1- **Accountability** 2- Support 3- Involvemem (p*m-f) 4- Values 5- Closeness	1- **Support** 2- Involvement (F-p) 3- Closeness 4- Accountability 5- Values	1- **Involvement** (P-C-f) 2- Support 3- Closeness 4- Values 5- Accountability	1- **Support** 2- Accountability 3- Values 4- Involvement (F-p) 5- Closeness	1- **Accountability** 2- Support 3- Involvement (p*-f) 4- Values 5- Closeness	1- **Involvement** (P.O-f) 2- Support 3- Closeness 4- Values 5- Accountability
People involved make it fun and enjoyable.	People involved make it fun and enjoyable.	Goal is important to me and someone close (Oscar, F).	Goal is important to me and someone close (Oscar, F).	Goal is important to me and someone close (F).	People involved make it fun and enjoyable.	Goal is important to me and someone close (F).	People involved make it fun and enjoyable.	People involved make it fun and enjoyable.
LEISURE (learning)	WORK (pedagogy)	STUDY (career)	STUDY (career)	LEISURE (functional)	LEISURE (learning)	TRAIT (attribute)	WORK (learning)	WORK (learning)
Collective Growth	Collective Growth	Defend Reputation	Tangible Outcome	Tangible Outcome	Learning Opportunity	Self-Discovery	Public Legacy	Learning Opportunity
Co-Learning (peers) **Co-Amending (peers)** **Enjoying company**	Enjoying Company Co-Learning (as educator)	Co-Learning (peers) Enjoying company	Co-Learning (peers) Dominating (parent)	Co-Learning (peers) Co-Amending (peers) **Codesigning** (F)	Co-Learning (peers) Co-Amending (peers) Enjoying company	Co-Learning (peers) Co-Amending (peers)	Co-Learning (peers)	Co-Learning (peers) Enjoying company
Pro-environmental Activation **Fermentizenship**	Pro-environmental Activation Need for social experiments	Hortophilia (ambition)	Agroecological Turn	Circular Economies/ Bottomup Industries	Hortophilia (practice) Life-long Learning	Phenomenological sensibilities/ Experimental Everyday	Waste Reduction/ Education preparing for Future Challenges	Agroecological Turn/ Anti-Consumerist Counterculture
Shared Struggle (peer)	Enthusiasm (peers)	Facilitator's Attention	Self-Advancement	Enthusiasm (peers)	Enthusiasm (peers)	Shared Imagination	Subgroup Cohesion	Enthusiasm (peers)
Partnering (agential)	Partnering (agential)	Informing (tokenist)	Informing (tokenist)	Partnering (agential)	Partnering (agential)	Informing (tokenist)	Partnering (agential)	Partnering (agential)
Collaborator (agential)	Advisor (agential)	Student (agential)	Student (tokenist)	Codesigner (agential)	Collaborator (agential)	Collaborator (agential)	Advisor (agential)	Collaborator (agential)
1-**Curiosity** 2-**Growth** 3-**Achievement**	1-**Curiosity** 2-Growth 3-Achievement	1-**Achievement** 2-Curiosity 3-Award (extrins) 4-Recognition (extrins)	1-**Achievement** 2-Recognition (extrins) 3-Curiosity 4-Award (extrins)	1-**Achievement** 2-Curiosity 3-Growth	1-**Curiosity** 2-Growth 3-Achievement	1-**Recognition** (extrins) 2-Curiosity 3-Achievement 4-Growth	1-**Curiosity** 2-Achievement 3-Growth	1-**Curiosity** 2-Growth 3-Achievement
Novelty Seeking/ Peer Response	Novelty Seeking/ Peer Response (motivators)	Novelty Seeking ('urine growing magic')	Novelty Seeking Scientific Discovery	Knowledge acquisition (renewable planting)	Novelty Seeking Knowledge acquisition (alternative planting)	Novelty Seeking Knowledge acquisition (toilet readings)	Novelty Seeking Peer Response	Novelty Seeking Knowledge acquisition (agroscience)
Work inspiration (people engagement)	Work inspiration (observe novice learning)	Citizen Science Contribution	Citizen Science Contribution (self-track food intake)	Leisure instrument (technical optimisation)	Leisure inspiration (system trial, eating monitoring)	Trait development (phenomenologist)	Work inspiration (eco-relationality)	Work inspiration (soil-growing is best)
Merit of experimental learning	Merit of experimental learning	Failure Resilience	Awareness for limits of instrumentalism	Failure Resilience	Rekindled hortophilia Failure Resilience	Communication and persuasion skills	Self-observation	Merit of experimental learning; self-observation
n/a	n/a	Display of hortophillic talent (green thumb)	Display of aspiring natural scientist	n/a	n/a	Display of sensibilities (human-plant interactions)	n/a	n/a
n/a	n/a	Certificate of completion	Certificate of completion	n/a	n/a	n/a	n/a	n/a
RAR > PAR > RAR **RAR: Us-Goal** **PAR: Me-Trait (relate)** **RAR: Us-Narrative**	RAR > PAR > RAR RAR: Us-Goal PAR: Me-Trait (study) RAR: Us-Narrative	RAR > ***CR*** > PAR > RAR RAR: Us-Goal/Trait >CR: Me-Fix (guilt av.) PAR: Me-Trait RAR: Us-Narrative	PAR > RAR > ***CR*** > PAR PAR: Me-Trait RAR: Us-Goal >CR: Me-Loss (numb) PAR: Me-Goal	RAR > PAR > PAR RAR: Us-Relations PAR: Me-Goal RAR: Us-Goal	RAR > PAR > PAR RAR: Us-Relations PAR: Me-Trait RAR: Us-Goal	RAR>PAR>PAR(>PAR) RAR: Us-Goal PAR: Me-Trait RAR: Us-Narrative (PAR: Me-Goal)	RAR > PAR > PAR RAR: Us-Relation PAR: Me-Trait RAR: Us-Narrative	PAR > PAR > PAR PAR: Me-Goal RAR: Us-Relations RAR: Us-Narrative
Peer Symbiosis (combine efforts)	Peers' Welfare (behaviour change)	Reputation (guilt avoidance)	Stress Reduction (frustration avoidance)	Relation Building (strategize efforts)	Venture Progress (deliverable)	Venture Progress (deliverable)	Venture Legacy (supporter dividend)	Peer Symbiosis (combine efforts)
033x group contact **009x facilitatr contact** **100% workshop (5)** **032d engagement** **042d task-active state** **! homevisit**	029x group contact 002x facilitatr contact 100% workshop (5) 042d engagement 032d task-active state ! farm visit	016x(+)*group contact 022x facilitatr contact 100% workshop (5) 052d engagement 038d task-active state ~~homevisit~~	016x(+)*group contact 022x facilitatr contact 100% workshop (5) 042d engagement 022d task-active state ~~homevisit~~	028x group contact 024x facilitatr contact 100% workshop (5) 102d engagement 102d task-active state ! homevisit	030x group contact 002x facilitatr contact 100% workshop (5) 042d engagement 042d task-active state ! homevisit	018x group contact 010x facilitatr contact 100% workshop (5) 042d engagement 042d task-active state ~~homevisit~~	019x(+)*group contact 009x facilitatr contact 080% workshop (4) 042d engagement 022d task-active state ! homevisit	031x group contact 001x facilitatr contact 100% workshop (5) 042d engagement 022d task-active state ~~homevisit~~
Collective Reward (community activation)	Collective Reward (behaviour change)	Hortitechnic Training	Hortitechnic Solution	Hortitechnic Research Platform	Hortitechnic Solution	Expand Self-Consciousness	Hortitechnic Solution	Hortitechnic Solution
Transpersonal > Hedonic > Eudemonic	Transpersonal > Hedonic > Eudemonic	Transpersonal > Emotional Correction > Eudemonic	Transpersonal > Emotional Correction > Hedonic	Transpersonal > Hedonic > Eudemonic	Transpersonal > Hedonic > Eudemonic	Transpersonal > Eudemonic > Hedonic	Transpersonal > Hedonic > Eudemonic	Hedonic > Transpersonal > Eudemonic
Failure resilience, humour, reaffirmation	Reflection, social analysis, conceptual grasp	Failure resilience, perseverance	Failure resilience, question perfectionism	Negotiation skills, self-initiative	Competence building, communication skills	Perseverance, adaptability, research organisation	Reflection, failure resilience, support skills	Peer engagement and retention, humour
Well integrated	Well integrated	Integrated with self-regulating reflex	Integrated with dissociation	Well integrated	Well integrated	Well integrated with abrupt dissociation	Well integrated	Well integrated
Leisure > Self-Improvement > Work	Health > Work > Self-Improvement	Study > Self-Improvement	Study > Self-Advancement (career)	Leisure > Relations > Trait	Leisure > Self-Improvement > Trait	Trait > Relation > Trait	Work > Relations > Trait	Work > Relations > Work
AVERAGE	AVERAGE	OUTLIER	AVERAGE	OUTLIER	AVERAGE	OUTLIER	AVERAGE	AVERAGE
Highly transpersonal motives and ideals with high failure acceptance	Highly transpersonal motives for social ideals	Transpersonal goal pursuit for correcting and beneficial motives	Transpersonal goal pursuit for own gain	Transpersonal motives for hortitechnical advancement	Transpersonal motives for shared learning outcome	Transpersonal goal pursuit for self-determined motives	Transpersonal motives for shared learning outcome	Transpersonal motives for 'panarchic' collaboration and learning outcome
Inclusive-explorative, playfulness	Strategically adventurous	Reconstituting self-worth, guilt avoidance	Uncertainty avoidance	Strategic, adventuring	Invigorated enthusiasm	Transporting and persuading	'relationally rational'	Optimistically cynical, authority- and rule-defying,
Communal homemaker	*Agro-pedagogic homemaker*	*Pupil homemaker*	*Instagramming homemaker*	*Prudent homemaker*	*Hortophillic homemaker*	*Susceptible homemaker*	*Educatory homemaker*	*Circumspect homemaker*

ACRONYMS:

RARs = Relationally-Autonomous Reasons; **PARs** = Personally-Autonomous Reasons; **CRs** = Controlled Reasons; **x** = times of verbal contact; **d** = days of engagement; **P(p)** = peers; **F(f)** = facilitator; **S(s)** = Spouse; **(+)*** = WhatsApp subgroup of Nancy, Oscar, Igor, Becky and 2 more

Quality of relations = Levels of Engagement (Arnstein, 1969): **Agential:** Controlling; Influencing; Delegating; Partnering. **Tokenist:** Pacified; Consulted; Informed. **Abandoned:** Treated; Manipulated.

Bundled timeline of existential passages

Participatory study *ANTHROPONIX*

To relate the existential passages from the *integrative autonomy* chords into the context of group interactions, they can be displayed on a timeline in a Sankey diagram.

Sankey diagram with four patterns of existential passages of transpersonal (orange), self-determined (blue), relationally-transitioning (green) and controlled-transitioning (purple) in relation to events, encounters and interactions.