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Research article

Learning to find a way out of non-sustainable systems

Katrien Van Poeck [a,b,*], Leif Östman [b]

[a] Ghent University, Department of Political Sciences, Centre for Sustainable Development, Poel 16, Ghent B-9000, Belgium
[b] Uppsala University, Department of Education, Box 2136, Uppsala 750 02, Sweden

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ABSTRACT

This article presents and illustrates an analytical framework designed to open-up the black-box of what and how people learn while trying to tackle sustainability problems and to investigate the potential of learning processes and outcomes to enable transitions. It consists of an analytical method: practical epistemology analysis, and two analytical models: transactional learning theory and the multi-level perspective on sustainability transitions. The framework is empirically illustrated with an analysis of what/how people learn through participating in workshops to develop scenarios for creating a more sustainable urban food system. The article presents three different learning situations, reveals how diverse learning processes have varied potential to enable sustainability transitions and discusses how such studies can provide guidance for improving learning in the context sustainability transitions.

1. Introduction: learning in sustainability transitions

Recently *Environmental Innovation and Societal Transitions* published a special issue on learning in sustainability transitions (ST), a very relevant contribution to ST literature considering that learning is often seen as vital for transforming our world into a more sustainable direction. The collection contains, among other contributions, three reviews of literature on learning in STs that together – starting from diverse yet complementary perspectives – provide an overview of the state of the art of research on the topic (van Mierlo and Beers, 2020; Van Poeck et al., 2020; Goyal and Howlett, 2020). They shed light on why learning is regarded important in view of STs, what and how people are assumed to learn in STs and what are gaps in the currently available scientific knowledge on the topic.

In this literature several arguments are raised to highlight why learning is a vital means for fostering STs. Goyal and Howlett's (2020) review identifies four key motives for the importance of learning in view of STs: Niche development, regime destabilisation, overcoming path dependency, and political change. Van Poeck et al. (2020) found ST researchers arguing for learning as a prerequisite for regime change; for the development, maturation and aggregation of niches that provide alternatives for currently non-sustainable regimes; for disseminating ideas, practices and experiments; for handling the complexity of STs; for developing shared visions and plans; for collective problem-solving; for a better governance of STs; for developing new knowledge and for questioning what is taken for granted. As to what is learned – or deemed necessary to learn – Van Poeck et al. (2020) distinguish in the investigated literature practical learning outcomes (e.g. more sustainable technologies and practices, innovative solutions for sustainability challenges), conceptual learning outcomes (e.g. new knowledge, commitment, visions, framings) and relational learning outcomes (e.g. new networks, trust). They also draw attention to how several authors emphasise the specificity of the learning context as being

* Corresponding author at: Ghent University, Department of Political Sciences, Centre for Sustainable Development, Poel 16, Ghent B-9000, Belgium.
E-mail addresses: katrien.vanpoeck@ugent.be, katrien.vanpoeck@edu.uu.se (K. Van Poeck), leif.ostman@edu.uu.se (L. Östman).

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characterised by uncertainty, complexity, plurality, normativity, dissent, resistance to traditional steering and orientation towards experimentation and exploration. By identifying different types of learning and a variety of learning settings, both Goyal and Howlett's (2020) and Van Poeck et al.'s (2020) reviews show that in ST literature, learning is approached as a more-than-individual phenomenon that entails an important collective dimension.

The literature reviews of van Mierlo and Beers (2020) and Van Poeck et al. (2020) reveal important theoretical and empirical research gaps that can be summarised as a poor conceptual and empirical underpinning. 'Learning processes have hardly been conceptualised, discussed and elaborated within the field', van Mierlo and Beers (2020, p. 255) argue. Well-established research fields related to learning that could provide valuable insights – although currently none of them sufficiently addresses the complexity of transitions – are 'broadly ignored or loosely applied' (Ibid.). Van Poeck et al.'s (2020) review leads to similar conclusions. Although several authors explicitly refer to learning theories in their writings (e.g. theories of social learning or organisational learning, particularly on 'single-loop' and 'double-loop learning' or 'first order' and 'second order learning'), not all authors apply learning theories and several do it only superficially. The result is conceptual haziness and a lack of 'a clear, consistent understanding of the relation and distinction between "learning" and the changes in society that may be the result of it' (Van Poeck et al., 2020, p. 303). This lack of conceptual clarity, and particularly the confusion of the *process* and *outcomes* of learning, is illustrated with examples showing how authors sometimes treat both elements as synonyms or take for granted that societal change is the result of learning, thereby ignoring other potential factors. This theoretical gap is also mentioned within several of the reviewed papers (Boon and Bakker, 2016; Benson et al., 2016; Beers et al., 2016; Singer-Brodowski et al., 2018; Sol et al., 2018). These observations made the editors of the special issue conclude that there is a need for conceptual work that goes 'beyond a superficial use of notions such as social learning and double-loop learning' (van Mierlo et al., 2020, p. 253). Furthermore, the empirical knowledge base for progressing our understanding of learning in STs is weak. As the editors argue: Learning is assumed to take place, but is neither specified nor critically investigated (van Mierlo et al., 2020). Van Poeck et al. (2020) illustrate that many of the reviewed empirical research contributions do not convincingly reveal *that, what* and *how* people are learning in practices striving for STs. Besides some notable exceptions[1], strong claims are made without sufficient empirical evidence. It is claimed, for instance, *that* it is learning that leads to policy change or to attitudinal change while evidence only shows that change has emerged, not that learning – instead of other, equally plausible factors such as economic incentives or political changes – was the initiatory and driving force of it. Furthermore, it often remains black-boxed *what* exactly it is that people learn. For instance, 'reframing' is put forward as an important learning outcome but more work remains to be done to provide empirical examples of the way in which sustainability issues are reframed, i.e. the learning content. The same goes for *how* (assumed) learning takes shape. Beyond important general, yet abstract references to enabling conditions such as space for experimentation, convincing empirical evidence of which elements and mechanisms influence learning and in which direction is very rare.

This article is intended as a follow-up to the special issue and aims to address the identified shortcomings in existing research on learning in STs. Instead of ignoring 'well-established research fields related to learning' we draw on pragmatist didactic research (theoretically and methodologically) and in order to acknowledge the complexity of transitions we employ the multi-level perspective on STs. We build on earlier conceptual work that we introduced in the abovementioned special issue (Van Poeck et al., 2020) and take it a step further by presenting and illustrating a methodological framework designed to open-up the black-box of what and how people learn while trying to tackle sustainability problems. It consists of an analytical method and two analytical models (see below) which, in combination, allow us to deepen our understanding of learning in STs by investigating the potential of learning processes and outcomes to enable transitions. We illustrate this analytical approach by applying it to an empirical analysis of learning within a project aimed at creating a more sustainable urban food system through upscaling the Short Food Supply Chain (SFSC). Our current food system causes severe socio-ecological problems such as malnutrition, food insecurity, food wastage, greenhouse gas emissions, erosion and loss of biodiversity (Dessein et al., 2017; El Bilali, 2019). The analysed initiative can be seen as the development of a niche (see below) that aims to offer an alternative for this non-sustainable food system. As we elaborate in the discussion section, our methodology allows to analyse the role and potential of learning in how such niches are developed through day-to-day actions of actors involved in these (micro) practices and how this *may* eventually contribute to a profound systemic (macro) transition decades from now. Given the open-endedness of STs (Geels, 2020), it is impossible to investigate how learning practices today *directly* and *certainly* affect long-term societal transitions. What *is* possible, however, is to identify – in contemporary observable phenomena – the available loci of intervention for trying to influence, accelerate or reorient STs. After all, even major transitions are always *made* – be it not always intentionally of managerially – in action, in people's day-to-day practices. The aim of this article is to offer an analytical approach that enables us to gain more insight in the role of learning in these everyday struggles of 'the making of' STs through in-depth empirical investigation of what and how people learn while engaging with sustainability challenges and through assessing the varying potentialities for transition thereof.

In Section 2 we explain how our analysis is theoretically underpinned by a pragmatist, transactional conceptualisation of learning in the context of STs inspired by the work of John Dewey. Subsequently, in Section 3, we explicate our methodological approach in detail by explaining how we combine practical epistemology analysis, transactional learning theory and the multi-level perspective on STs. Section 4 describes the case and the empirical data before we apply the methodology in order to empirically illustrate it in Section 5. The explorative case study allows us to identify three different learning situations and to shed light on how different learning processes have varied potential to enable a ST. We conclude by discussing in Section 6 how the presented analytical approach can

[1] E.g. Beers et al.'s (2016) thorough empirical investigation of the influence of interaction patterns on learning outcomes or Ingram's (2018) detailed analysis of the complex interplay between the knowledge systems of the permaculture niche and the mainstream agricultural regime.

deliver knowledge that can provide guidance for improving learning in the context STs and what sort of future research is necessary in order to deliver ground-breaking new insights on the topic.

The methodological framework, which will be unpacked an illustrated throughout the article is summarised in Fig. 1.

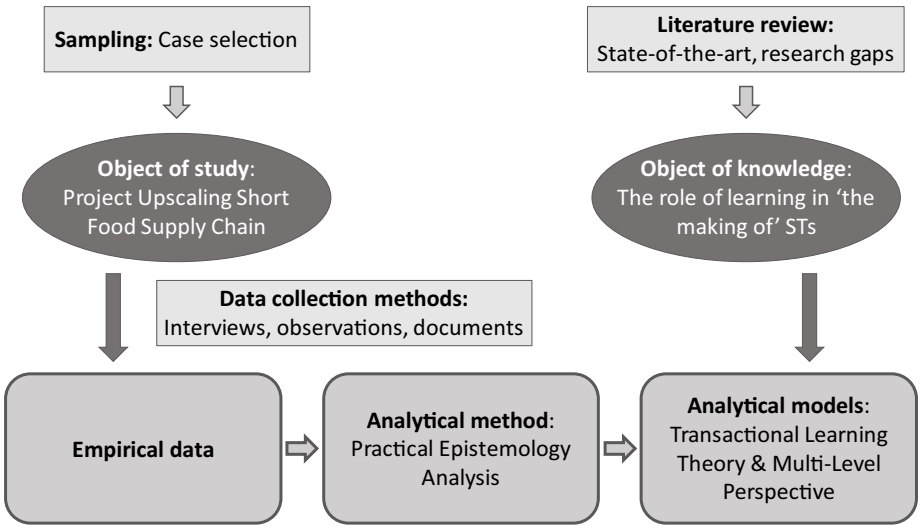

Fig. 1. Methodological framework.

2. A pragmatist theoretical background

Van Poeck et al.'s (2020) abovementioned literature review identified a number of concrete challenges for adequately investigating learning in STs, i.e. the need to gain insight in the relation between learning and change, in how learning can foster creativity, in how/what people learn from interaction and in how/what people learn from experience and experimentation. Pragmatist theory, in particular the work of Dewey and how it has been applied in didactic research, provides a useful framework for addressing these challenges (for an in-depth argumentation see Van Poeck et al., 2020). Today, severe socio-ecological problems increasingly disturb our (individual) habits and (collective) customs. In transition terminology (see also below), the latter can be seen as a disturbance of the currently dominant regime. As our changing environment thus increasingly emerges as a crisis that disturbs our habitual ways of thinking and acting, we are faced with the challenge of finding new ways of inhabiting the world – new regimes. As we further elaborate below, a pragmatist approach to the phases of habit, crisis and creativity that mark human action (Shilling, 2008) enables us to ground investigations precisely in the disturbance of habits as a crucial driver for creative learning and, potentially, for the making and unmaking of systems. It allows to investigate learning in terms of the (trans)formation of habits in and through attempts to solve real-life problems. This differs fundamentally from traditional didactic research that is mainly focused on investigating teaching and learning practices in relation to *predefined* learning outcomes or formal teacher goals. Here, however, we are dealing with the emergence of sustainability problems in people's daily lives that prompt them to join with others in searching for *novel* ways to overcome these obstacles. Pragmatism acknowledges this novelty, and is a particularly suitable framework, given its insistence that the outcomes of creative actions forged in response to the crises associated with dysfunctional habits constitute 'the unforeseeable results of an adventure' (Dewey, 1958, p. 246). Creative actions constitute staging posts on the route to the establishment of new, and *newly adaptable*, habits. We have here a distinction between those 'routine, unintelligent habit[s]' that constrained people's responses to sustainability problems, and those 'intelligent' and even 'artistic' habits that emerge from dealing creatively with crises (Dewey, 1922, p. 67). These more responsive habits are characterised by meaningful thought, observation and reflection; properties which are prerequisites for their potential varied and adaptable use in accordance with self-selected desires and purposes (Dewey, 1934). They bring about the power to control the environment and to modify actions based on prior experiences, and the imagination of future possibilities that open-up a space for creativity or, as Garrison et al. (2015) call it, for 'educative moments' as a result of critical and creative inquiry. Gaining insight in conditions for the (trans)formation of habits and in the emergence and handling of educative moments contributes to a better understanding of the creative potential of learning practices.

In ST research, authors have drawn attention to the important distinction between so-called first and second order learning (e.g. Schot and Geels, 2008) or, relatedly, single- and double-loop learning (Van Mierlo and Beers, 2020) as elaborated by Argyris and Schön (1996). Transitions, it is argued, require changes of dominant ways of thinking and acting, deeply rooted in prevailing assumptions, convictions, values, rules, habits and goals. The – second order, double-loop – learning needed to facilitate STs should therefore induce change at that level and, hence, move beyond a superficial focus on strategies for realising existing goals which do not call into question the underlying assumptions and phenomena. The pragmatist focus on the making, unmaking and re-making of habits in response to the disturbance of routine ways of thinking and acting aligns well with ST studies' interest in the disturbance and

re-creation of non-sustainable regimes and the role that second order, double-loop learning can play in that[2].

Philosophical pragmatism, and particularly Dewey's writings on experiential learning and the notion of 'transaction' he developed together with Bentley, has been used to construct a transactional learning theory (Östman et al., 2019a – see Fig. 2). It is built on the pragmatist approach to action in terms of habit-crisis-creativity and its focus on the dynamic interplay between human action and the environment in/through which it takes place that Dewey and Bentley (1949) have labelled 'transaction'. They perceive humans as always already in relation to the environment, in contrast to a mechanistic, interactional perspective where the subject and the environment are seen as independent entities that inter-act (Ryan, 2011). Thus, from a transactional perspective learning is approached as a process in which both individuals and the world transform *reciprocally* and *simultaneously*[3]: People's actions change the environment and shifts of activity happen in response to a changing environment. Learning is regarded as a continuous process of doing and undergoing the consequences of actions that takes place through encounters between persons and their (social and material) environment. This adds a sequential dimension in addition to the simultaneous and reciprocal perspective on change. In Dewey's (1938, p.35) words: 'Every experience enacted and undergone modifies the one who acts and undergoes, while this modification affects, whether we wish it or not, the quality of subsequent experiences. For it is a somewhat different person who enters into them.' The learning outcomes emerging from these encounters are not seen as static, let alone pre-determined cognitive properties to achieve but rather as being dynamically made and transformed in and through action – over time.

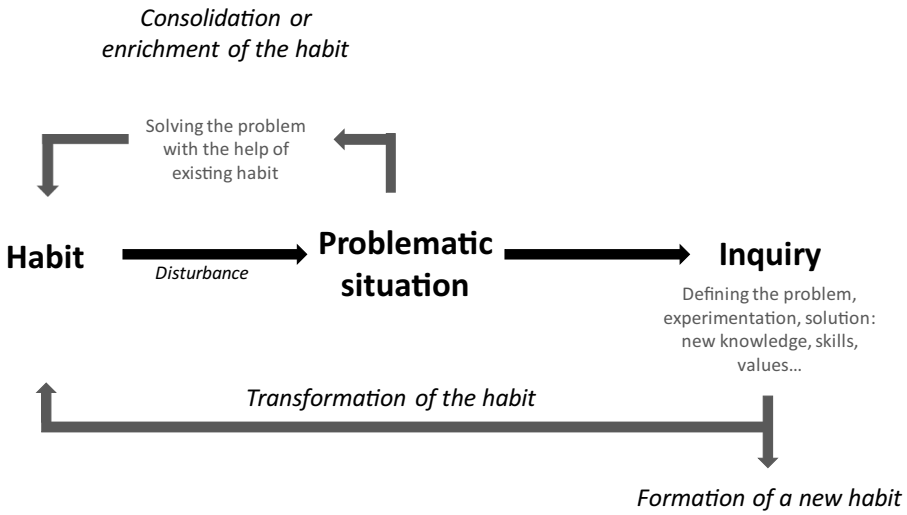

Fig. 2. Transactional learning theory.

As Fig. 2 illustrates, the transactional learning theory approaches learning as being incited by a 'problematic situation' in which our routine ways of thinking and acting are disturbed and which, thus, makes it impossible to proceed habitually. This is grounded in the pragmatist assumption that, in everyday life, we mainly act *without* reflecting. If one has acquired the habit, for instance, to shop sustainably one will habitually buy only certain products and not others without consciously reflecting on criteria for selecting them time after time. Rather, one has established a specific way of coordinating with the surrounding world which could mean that one shops in a supermarket that offers the preferred products and habitually fills the shopping cart with eco-certified and/or fair trade products. One only needs to superficially look at the packaging and labels to take them from the racks. Reflection, and hence learning first start when our environment disturbs such habits. Sometimes we can easily solve problematic situations with the help of existing habits. For instance, when suddenly one of the usual eco-certified products is no longer available and the sustainable shopper scans the racks and finds an alternative product with another eco-label. Learning, here, results in consolidating and enriching the habit. But sometimes the problem is harder to resolve and requires an 'inquiry' (Dewey, 1938). For instance, when the shopper would see in a documentary that the criteria to obtain a specific eco-label are not as strict as they should be to guarantee sustainable products. This profoundly disturbs the habit as one is no longer sure that checking eco-labels is a sufficient strategy for sustainable consumption. In order to (re)gain assurance, one needs to start an inquiry. Is the provided information correct? What exactly is the problem addressed in the documentary? What causes it? Are there other eco-labels that are more reliable? Through experimentation one tries to solve the problem which results, if successful, in new knowledge, skills, values, identities, etc. Learning can in this case result in a substantial transformation of habits (e.g. distinguishing reliable from unreliable labels) or even the start of a new habit (e.g. consuming less).

[2] In fact, Donald Schön refers to Dewey's legacy as a primary philosophical anchor for his work on (organisational) learning while some scholars who have investigated Dewey's reception in Schön's writings argue that Dewey's theories offer a more expansive and integrated framework (Shapiro, 2010).

[3] Reciprocal and simultaneous as opposed to linear and teleological in an interactional perspective.

A transactional methodology enables us to investigate the dynamic interplay between human action and the environment in/through which it takes place, and thus to overcome important limitations of other research paradigms in learning studies. Cognitivist research, for example, analyses learning as something that happens within individuals' minds but has been criticised for failing to account for how people's environment (e.g. social interaction, cultural influences) affects learning (Schoultz et al., 2001). Sociocultural research, in contrast, attends to how an individual's environment affects her/his development but has been criticised for overlooking the effect of intrapersonal elements (e.g. earlier acquired knowledge, values) (Hodkinson et al., 2007). Transactional pragmatism offers an alternative foundation as it recognises and explores the distinctive elements of human action and the environment, and the dynamic relationship that exists between them (Shilling, 2008). Analysing learning transactionally involves revealing and explicating the *interplay* between analytically distinguishable yet intricately entangled intrapersonal aspects on the one hand and (interpersonal, institutional, material) aspects of the environment on the other (see Fig. 3). By investigating this interplay it is possible to trace what Wertsch (1998) calls 'privileging', i.e. how the performed interplay includes certain intrapersonal aspects and makes certain aspects of the environment present and valid while other are neglected. This dynamic process of inclusion and exclusion in actions steers the meaning-making in a certain direction as it affects which questions, ideas, objects, etc. are acted upon as reasonable and fruitful and, thus, taken into account and which ones are not, which ones are ignored or disregarded.

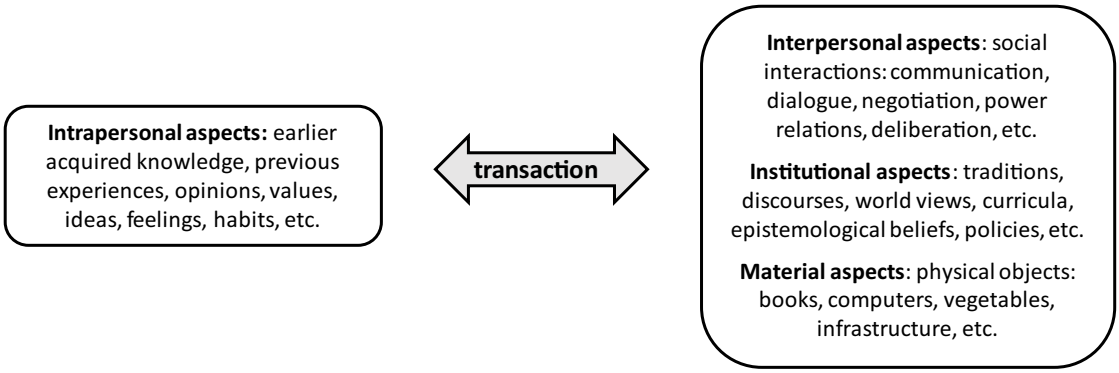

Fig. 3. Interplay between intrapersonal aspects and aspects of the environment.

The transactional learning theory thus operationalises philosophical pragmatism into a conceptualisation of learning as a matter of overcoming problematic situations though a continuous process of action (doing) and reflection (undergoing the consequences of actions) in encounters between persons and their environment. As such, it provides us with a useful analytical model to explain the findings of our empirical analyses as to *whether* learning takes place (are problematic situations overcome?) and, if so, *what* people learn (which habits are enriched/consolidated/(trans)formed?) and *how* they learn (through which specific interplay between earlier experience and what is encountered in the material/social environment?). What is needed next, is a fruitful analytical method to draw useful empirical findings from the empirical data as well as a model that helps us to assess the outcomes of learning processes in terms of their potential to foster STs. The two-step analytical approach elaborated in the next section encompasses both.

3. A two-step analytical approach

Our analytical work is done in two steps. First we conduct a detailed study of learning using practical epistemology analysis (PEA) and the transactional learning theory. Above we have described the transactional learning theory and in this section we will elaborate how this analytical model can be used in combination with the analytical method PEA in order to open-up the black-box of learning processes. The second step consists of an assessment of the transitional potential of the process and outcomes of learning analysed in the first step using the multi-level perspective (MLP) as an analytical model (see also Fig. 1).

3.1. Opening-up the black-box of learning

As a first analytical step in the case study, we conduct a PEA. This analytical method developed by Wickman and Östman (2002) has been applied in many empirical studies in didactic research and is well-suited for transactional investigations of learning. It is designed for analysing the making of meaning in encounters between people and their environment through a 'high-resolution' analysis of video/audio-recorded observations. Here, we use it for analysing the observed workshops in order to generate findings from our empirical data that are subsequently explained with the above elaborated transactional learning theory[4]. A central assumption of PEA is that it is *in transaction* that humans and their environment obtain meaning, reciprocally and simultaneously. Hence, meaning is not

[4] In combination with other theories and analytical models PEA can also be used for studying meaning-making in other-than-learning practices, e.g. policy deliberation or science-in-the-making.

approached as something that exists within things as such but instead seen as dynamically created and transformed in and by action, through the relations that are created by re-actualising prior experiences in order to make meaning of/in a new situation. Meaning is thus literally approached as something we *make*.

PEA is a systematic analytical method to derive empirical findings, out of the gathered empirical data, on how meaning is created in action by identifying the 'gaps' that occur when people encounter a new situation. Gaps occur in every encounter, yet are often bridged immediately. At times, however, the gap is too big to bridge automatically and people hesitate, start to guess, disagree, ask for help, etc. They cannot simply proceed with their activity. These gaps are 'lingering gaps'. In order to be able to proceed, they need to create 'relations' between something that already 'stands fast' for them – previous experience, earlier acquired knowledge, skills, beliefs, etc. – and the new situation that is encountered. Meaning is made through the created relations. In terms of the transactional learning theory, our analytical model, we can say that a lingering gap confronts learners with a problematic situation that prevents them to continue habitually. Learning is assumed to have happened if the gap is successfully bridged by creating a relation to what stands fast. This becomes visible as the participants are able to proceed. Earlier experiences are 're-actualised' to make the new situation intelligible and the participants develop an expanded and more specific repertoire for action.

Empirical analyses using PEA thus start with identifying lingering gaps that become visible through for example hesitations, questions, disagreement on how to continue, and subsequently analysing whether and how these gaps are filled through the created relations between what stands fast and what is encountered in the present situation. To fill a lingering gap often requires an inquiry. The learners – or the facilitators of learning processes – then need to stage new encounters to fill the gap, for example, with a book, an expert, peers. Through PEA we can trace the privileging (see above) that occurs in meaning-making processes. This dynamic process of inclusion and exclusion steers the meaning-making towards certain learning outcomes. PEA, in combination with the transactional learning theory, thus allows to gain detailed insight in the *content* of meaning-making and learning (i.e. Which relations and, hence, meanings are created? What is privileged? What do people have learned? Which habits are consolidated, enriched or (trans)formed?) as well as in the *process* through which it occurs (i.e. Which encounters influence this? What is the impact of the facilitator? Of other participants? Of encountered objects?). As such, it allows to open the black-box of learning processes and to deliver empirical evidence of whether, what and how people learn.

Another merit of PEA is that it helps to avoid an important pitfall in interpretive research methodologies. 'The difficulty in interpreting qualitative data', Feldman (1995, p. 72–73) argues, 'is not in learning how to create interpretations but in learning how to get away from pre-established interpretations'. She mentions two main sorts of pre-established interpretations that are difficult to avoid: Those interpretations made by people in the setting being studied, and those made by other researchers and theorists about phenomena similar to the ones under study. PEA is developed as an analytical method *in-between* raw data and theoretical frameworks with the aim to discipline and systematise the researcher's work, to maintain openness for empirical surprises and to disrupt potential *Hineininterpretierung*. By following a rigorous analytical protocol of identifying gaps, relations and encounters, researchers are offered a tool that prevents them from only seeing what they expect to see but instead helps them to remain close to the data and approach these analytically instead of immediately interpretively. The aim is to help researchers thinking about what they see instead of seeing what they (already) think. Interpretation is postponed. In order to make this possible, analytical methods need to be built on different theories as those used in the analytical models to understand and explain the phenomenon under study. For example, if one wants to investigate people's environmental values by conducting a survey one may interpret and explain the date using a theoretical model on the difference between preservation and utilisation values. Yet, the statistical analytical method used to analyse the raw data is built on another, i.c. mathematical theory. Likewise, we use the systematic findings generated in PEA to investigate learning in STs drawing on pragmatist didactic theory, but PEA itself is built upon another theory, i.e. Wittgenstein's first-person perspective on language use (see Wickman and Östman, 2002 for a detailed explanation).

3.2. Assessing the transitional potential of learning with the multi-level perspective

Opening-up the black-box of what and how people learn does, in itself, not enable us to answer the question if and to what extent the outcomes of the investigated learning practices may contribute to a potential ST. 'Transitions' have been characterised as fundamental changes in a societal system in the sense that existing structures, cultures and practices, that are anchored in a society, are broken down and new ones become dominant (Block and Paredis, 2019). This involves long-term processes of co-evolutionary changes in multiple dimensions (Grin et al., 2010): Technology, actors, rules, infrastructures, power relations, patterns of thinking, problem definitions, cultural meanings, etc. Such complex, non-linear processes do not result from one single driver or cause, but involve a complex interplay of different processes and factors (Geels, 2012). This implies uncertainty and open-endedness: There are multiple transition pathways (Geels and Schot, 2007), multiple promising innovations and initiatives in varied domains and it is impossible to predict which of these will prevail (Köhler et al., 2019). Given this complexity and open-endedness of transitions and the normative and often controversial character of the question what is 'sustainable' (Grin et al., 2010), we are dealing here with a very challenging question. It takes us beyond the focus of opening-up the black-box of learning in action and demands that we assess these learning processes and their outcomes in terms of the *potential* to enable or constrain STs. In order to do that, we complement our PEA analysis with a second analytical step in which we assess the PEA results through an MLP lens.

The MLP views transitions as non-linear processes that result from the interplay of multiple developments at 3 analytical levels: Socio-technical 'regimes', 'niches' and 'landscape' (Geels 2007, 2012; Geels and Schot, 2007). A regime is the dominant way of fulfilling a societal function (e.g. housing, transportation, food) and consists of mainstream technologies, actor networks, rules, practices, artefacts, infrastructures, ways of thinking, etc. The interconnectedness of all these elements, it is argued, keeps the regime 'dynamically stable' (Geels, 2005a, p. 77). They function as lock-in mechanisms that provide strong steering, yet leave some room for

creativity and adaptation to new situations and for improving the dominant design of a system. However, this is incremental change that stays within the bounds of the existing regime. Radical novelties that diverge strongly from what is normal in the regime are seen to emerge in niches. As spaces where 'non-conformism' (Rotmans and Loorbach, 2010, p. 132) develops, niche configurations are less stable than regimes: They consist of technologies, rules and practices *in-the-making*. Whether niches are successful and influential, however, largely depends on evolutions at the other levels. The level of the socio-technical landscape is constituted by deep cultural patterns, macro-political developments, natural circumstances (e.g. global climate change) and material environments (infrastructures). This 'technical, physical and material backdrop' of society (Geels and Schot, 2007, p. 403) is beyond the direct influence of regime or niche actors but makes some actions easier than others. Yet, it enables 'windows of opportunity' to open-up during which regimes may undergo profound change.

With its focus on situated interactions between people and their environment and its attention for a dynamic interplay of stability and change, the MLP can be fruitfully combined with our transactional perspective on how learning can contribute to the (trans-) formation of habits. Its 'core analytical puzzle' (Geels, 2011, p. 25) is to understand how innovations can emerge within a context where various lock-in mechanisms (e.g. investments in technology, infrastructures and competencies, institutional commitments, shared beliefs and discourses, power relations, political lobbying by incumbents, consumer lifestyles and preferences that became adjusted to existing technical systems) stabilise dominant regimes and how these innovations can replace, transform or reconfigure existing systems. Hence, after revealing privileging processes with a PEA analysis, the second step in our analysis is to assess these results from a multi-level perspective on STs. Therefore, we draw on existing MLP analyses in order to analyse whether/how ST elements – e.g. characteristics of the dominant regime, lock-ins that consolidate its stability, internal contradictions within the regime that may disrupt this stability, existing niche practices – are employed as resources in the learning processes and how they transactionally *function* in these learning processes in terms of enabling or constraining a potential transition. Thus, we investigate how transition elements function as, for instance, a lock-in mechanism, a window of opportunity, etc. in the privileging process and how this steers the learning process in a direction that has less or more potential to enable a ST.

4. Empirical case: workshops for a sustainable urban food system

For our purpose to illustrate how this analytical approach can provide insight in the role of learning in everyday struggles of 'the making of' STs (our 'object of knowledge') we had to select a case (an 'object of study') that enables us to observe and investigate what and how people learn while engaging with sustainability challenges. As briefly outlined above, varied blind spots have been identified that require further empirical investigation in order to progress scholarship on learning in STs. Here we have chosen to focus on a topic where ST scholars have consistently emphasised the vital role of learning (Köhler et al., 2019; Geels, 2020): The development and maturation of niches that can provide alternatives for currently non-sustainable regimes. Considering this, as well as the fact that our analytical approach requires data collected through 'in situ' observation of people's actions and that it aims to assess the potential of the learning in terms of fostering STs, we needed a case that fits the following three criteria: A practice where people deliberately try to develop a niche in response to sustainability challenges posed by the established socio-technical regime; access to activities where we can observe this; and availability of knowledge about (potential) STs in the making within this socio-technical system, including the potential of the niche-in-development to contribute to that.

A case situated in Ghent, a Belgian city with around 250.000 residents, fitted these criteria. Ghent has launched a local food policy that aims to pave the way for a transition towards a sustainable food system (Stad Gent, 2016). One of its strategic goals is to stimulate the SFSC and create close relationships between local food producers and consumers. In Ghent, there are already many established initiatives for stimulating SFSC at the level of business-to-consumer (B2C – farmers to individual customers). Initiatives at business-to-business level (B2B – farmers to the catering industry, large kitchens and retail), which are assumed to have great potential of substantially increasing the volumes of food traded in this way, are still scarce. The municipality therefore launched a project to develop scenarios for new initiatives (niches) that can upscale SFSC by focusing on B2B. A consortium of two research institutions was contracted to conduct this project and developed different scenarios together with diverse local stakeholders: Farmers, retailers, representatives of the catering industry, cooks in large kitchens, chefs of restaurants, civil servants, experts, etc. The design of these scenarios have been developed in workshops facilitated by the researchers that conducted the project[5]. Their report on the project (Dessein et al., 2017) includes an assessment of the developed scenarios' potential to contribute to a ST.

The empirical data we gathered consists of 2 interviews, 7 transcripts of audio-recorded workshops (439 pages), an audio-recorded public event (111 min) and a set of documents (the local food strategy, the municipality's call for tenders, the proposal of the contracted consortium and the final report of the research project). For the analysis in this paper, we focus on two workshops where the participants developed a scenario for a distribution platform[6] that facilitates SFSC between local producers and catering industries, large kitchens and retailers. As argued, for a detailed analysis of what and how people learn it is vital to scrutinise what they do and say in concrete actions, 'in situ'. Therefore the transcripts of observations are the main data sources. The interviews and documents are analysed in order to provide insight in the context and background.

[5] To avoid possible confusion, please note that these researchers are not the authors of this paper. They conducted research and development on how to upscale SFSC (= their 'object of knowledge') in a project that we selected as a case (= our 'object of study') to do research on the role of learning in 'the making of' STs (= our 'object of knowledge').

[6] The two other scenarios that have been developed concern a farmers' network and a knowledge platform.

5. Empirical illustration of the methodology

In what follows, we illustrate the presented methodology with the results of an explorative case study according to the two analytical steps explained in Section 3.

5.1. Step 1: Opening-up the black-box of learning

Our analysis of workshop where participants designed a scenario for a SFSC distribution platform resulted in identifying three very different types of learning instances that we repeatedly observed throughout the totality of the empirical data. Obviously, it moves beyond the scope of an article to present detailed analyses of 161 pages of transcripts. Therefore we present below a selection of three events that adequately illustrate the identified learning situations.

5.1.1. Event 1: Supermarkets

The first example comes from a subgroup discussion where the participants are asked to come up with ideas on how to organise the communication of the SFSC distribution platform. One of the things they discuss, is the difficulty to communicate towards several target audiences that work in a very different context. One of the participants, William,[7] raises the example that for a top-end restaurant the extra cost for a 'high quality carrot' will not have as big an impact on the total pricing of the menu than for a modest bistro or large kitchen. The others agree that this is a challenge for their communication strategy. A gap arises: How to deal with this? Emma, who works at an organic farm, tries to fill the gap with a suggestion: To communicate clearly about the platform's range of products by highlighting the distinction between 'quality carrots' and 'large-scale carrots' and to explain that this comes with a price difference. Table 1 presents the conversation between workshop participants.[8]

Table 1
Excerpt supermarkets.

1	Emma	Maybe we need to make a distinction in quality of carrots or so… I think… Quality and price, that we make a difference. Quality carrots from open ground and large scale carrots.
2	William	But everyone buys their vegetables in [names of 4 supermarkets]. And everyone likes them …
3	Emma	Yes, but not me … For example
4	William	Yes, but you are an
5	Emma	[interrupts] I am an exception, but I think that group is growing.
6	William	But let's say, the mainstream person goes to the store, buys his vegetables there. … And they eat it and they like it.
7	Emma	Yes, but I think that group is changing. For example me, I don't go to the supermarket anymore. It's a choice, because I can't find what I am-
8	William	[interrupts] Yes, but there aren't that many
9	Emma	No.
10	William	What percentage of the population?
11	Emma	Yes, but you can make a choice in that distribution platform. That choice exists, that option … that you say I … want *that* carrot, that you can choose that.
12	William	Then you come back to my story, right, that maybe that supermarket should offer that, because you will never be able to offer it at the same price. It will be a big difference if you have someone who delivers twenty kilos of carrots or someone who says I can supply you with ten tons of carrots, I can set up a production machine for that and in the end it costs ten cents less per carrot. It is, I put it bluntly, but do you understand? So for many, a lot of people, even for many families, the price will be incredibly important. And much more than you think, I think. And, and you are going to be willing to, I am also willing to pay more.
13	Emma	But we have now started a shop with our vegetables and that works. The prices are more expensive, but people buy there and it keeps getting better and better and better. So there's an audience for that. And our range of products is much smaller so I think, the range is smaller the price is higher so maybe that works?
14	William	I believe that. I believe immediately.
15	Emma	Maybe that works, if we make a distinction there.
16	William	But we are going, we cannot estimate your volume of customers right? Well, despite the fact that it works better and better and that there are many people who are aware of that, we can, well yeah, that's not even 1% of any [supermarket].
17	Emma	But we are not talking about supermarkets now, right?

As explained, we investigate the mechanism of learning as filling gaps by creating relations between what stands fast (e.g. what participants already know, what they have experienced before) and what is encountered in the present situation. In the suggestion that Emma formulates in an attempt to fill the gap (line 1), she creates three relations: 1) a relation between a distinction in quality of carrots and a difference in price (they discussed this topic earlier in the conversation, where it gave rise to the gap that emerged, and now Emma connects this to their communication strategy), 2) a relation between quality carrots and carrots grown in open ground, and 3) a relation that opposes large scale carrots to quality carrots. In doing so, Emma puts forward the distinction in quality of carrots as a legitimate criterion for a difference in price as something that should be taken into account in the privileging. William's response (line 2), however, excludes Emma's relation 'large scale carrots – not – quality carrots' from the privileging. Arguing that everyone

[7] All the names in the empirical examples are pseudonyms in order to guarantee the participants' anonymity.
[8] Extended tables on the PEA that also include an overview of all the relations that are created in an attempt to fill the gap as well as how this affects the privileging process are included in Appendix 1 in order to offer transparency about the analysis and illustrate the procedure in detail.

buys their vegetables in the supermarket and likes them, he points out that this relation does not constitute a valid criterion. As 'everyone likes' large-scale supermarket carrots, Emma's conception of a distinction in quality is, for William, not a legitimate criterion for a price difference.

What follows, is a sort of right or wrong game. As Emma and William continue to disagree, none of the relations that they create is able to fill the gap. The gap lingers. Throughout the conversation, they do not succeed in finding an agreed-upon answer[9] to the question how to deal with the concern that for a modest bistro or large kitchen the extra cost for a 'high quality carrot' will have a bigger impact on the total pricing of the menu than for a top-end restaurant. What happens in this conversation can be seen as a lingering struggle over what should be included and excluded in the privileging process. Both Emma and William repeatedly re-actualise their own earlier experiences and beliefs in order to exclude each other's claims, arguments and points of view from the privileging. Emma draws on her own habit of not shopping in supermarkets (line 3, 5, 7) and her experience of starting a shop (line 13) to weaken or exclude William's claims. William draws on existing knowledge about the dominant market share of supermarket purchases and his belief that 'mainstream people' like the vegetables they purchase there (line 2, 6, 8, 10, 16) and about the market advantages of supermarkets (line 12) to weaken or exclude Emma's suggestion and arguments. Emma's interventions try to steer the privileging – and, thus, the joint meaning-making – in the direction of communicating clearly about distinctions in quality and price. William's interventions, on the other hand, try to steer the privileging in the direction of acknowledging the importance of sufficient scale and the way in which supermarkets can contribute to achieving this. The outcome remains undecided.

Although, at an individual level, Emma and William may have learned something – for example, a more developed argumentation for their own points of view – they did not, together, learn to find a way out of the problematic situation. This is also reflected in the report[10] of the researchers that facilitated the workshops (Dessein et al., 2017, p. 102 – our translation): *'The distribution platform has difficulties in dealing with a diverse market, that is, with the needs of purchasers that vary substantially (e.g. a Michelin star restaurant that pursues quality and exclusivity versus a large kitchen that puts ease-of-use and lowest production price first)'.*

5.1.2. Event 2: Kitchen infrastructure

In the excerpt presented in Table 2, participants discuss in a subgroup how to match the different expectations on the supply and demand side of the distribution platform. Encountering the fact that the vegetables that would be delivered to the platform by the farmers would not be processed but that it would be fresh vegetables straight from the field, John, a cook in a large kitchen of a retirement home, raises a concern. For him this creates a problematic situation as it disturbs his habit to use convenience food. A gap emerges as he does not know how the specificity of the supply could match his particular needs.

Table 2
Excerpt kitchen infrastructure.

1	John	For example we buy… I don't even have the space in my kitchen where I can peel potatoes. I don't have that anymore. I no longer have a space where I can process my vegetables. I *did* have that 20 years ago.
2	Eric	Yes yes yes yes I understand that.
3	John	For example, 20 years ago apples were peeled with four people sitting at the table, outside in the sun, with a cup of coffee and the radio on. … That was apple sauce. Now this would cost 1000 francs [= €25] per litre. That is no longer possible. That all disappeared right. …
4	Eric	Yes, that is what I mean by stepping back in time. If you only…
5	John	But you can't do that anymore, you can't reverse that. Well, certainly not on, on, on… mass distribution. That's not possible.
6	William	Not entirely, but there are some opportunities.
7	John	There are certainly some opportunities. There are some products that are certainly not a problem. For example salad, chicory and so on. That's not too much work. But it's about those other things.
8	Facilitator	And what opportunities do you see in it? …
9	William	I know a farmer who says … I have an agreement with two hospitals that I deliver to and all my harvest goes there and I have a much better price.
10	Eric	But is that also processed in the hospital, that entire harvest?
11	William	He works with a factory to peel it. … but I am just saying: that peeling could for example be included in that distribution platform.

In line 1 and 3, John creates relations between what is encountered in this workshop (the farmers delivering fresh vegetables) with what stands fast for him: His experience of having no space in the kitchen to process vegetables, personnel costs being too expensive to process food themselves, and his memories of how this was very different in the past. Through the confirming intervention of Eric (line 2) these concerns are included in the privileging process as relevant. It becomes something that is taken into account in the unfolding, collective meaning-making. John concludes that the way they cooked 20 years ago, is no longer possible today. Eric, however, creates a relation between John's re-actualisation of his experiences in the past with a suggestion he has made earlier in the conversation, i.e. to 'step back in time' (line 4). Initially, John promptly excludes this suggestion from the privileging as being impossible (line 5) but William's intervention opens up for *partially* including Eric's suggestion as something to take into account: There are *some*

[9] This is neither the case in the remainder of the subgroup discussion that follows after this excerpt.

[10] The report consists of a background sketch, an overview of international examples of B2B SFSC practices, a narrative description of the three participatory developed scenarios, and different scientific analyses of these scenarios. The latter are, for instance, a logistical analysis, a cost-benefit analysis, a Life Cycle Analysis of the climate impact, an MLP analysis and an analysis with the Technological Innovation System framework (Hekkert et al., 2007).

opportunities (line 6–7). The facilitator's intervention (line 8) encourages the participants to further specify this, which William does by creating a relation with his earlier experience with a farmer he knows (line 9). He re-actualises something that stands fast for him. Eric's response (line 10) urges him to further specify this by relating it to the initial concern (line 1) that large kitchens have difficulties to process fresh vegetables. Doing so, Eric re-includes this concern as something that should be taken into account – something that came to be taken for granted. This brings William to create a relation between his earlier experience and the current problematic situation by suggesting a new possibility (line 11): They could include the processing of the harvest as one of the activities of the distribution platform they are giving shape.

Through the participants' privileging, the present situation of large kitchens here functions as a determining condition for creating proposals for the future. All the same, existing examples are used to create new ideas on how the platform can deal with these conditions. Thus, in and through these encounters the participants co-construct a meaning-making process that allows to overcome the problematic situation and hence their inquiry opens-up for a transformation of habits.

5.1.3. Event 3: Seasonal food

The excerpt in Table 3 comes from the same subgroup discussion on matching expectations (see Event 2) where participants address the gap how to match supply and demand and where John also raises another concern, i.e. that the platform should always be able to deliver the food that its customers desire.

Table 3
Excerpt seasonal food.

1	John	But, but I think it's important when you organise such a platform, it is short chain coming from local merchants, but if a cook says one day … erm in June, I need red cabbage here today and then you don't have a single farmer in all of East Flanders who currently has red cabbages that he can get, that the platform must then be able to deliver it.
2	Hanna	But I think if you go for short chain, then actually, that's how it is … Short chain is also seasonal, in the end, right? So in June you will indeed not be able to find red cabbages at a farmer's, you can have that in the winter, but not in the summer right. So that's uh -
3	Paul	Then it's asparagus.
4	Hanna	Yes, yes, that's how it is.

In Line 1, John addresses the gap of how to match supply and demand by creating a relation between needs of the demand side (a cook may need red cabbage in June) and the implications for the supply side (then the platform must be able to deliver it). Doing so, he tries to include his concern in the privileging. Yet, the subsequent interventions of Hanna and Paul (line 2–4) exclude his claim from the privileging processes. Guaranteeing that the platform is always able to deliver everything that its customers desire is, for them, not something that should be taken into account in the design of the distribution platform. Creating relations between John's comment that 'farmers in East Flanders do not have red cabbage in June' and their earlier achieved knowledge and points of view (in June these farmers have other vegetables like asparagus and 'short chain is seasonal'), they conclude that a short chain distribution platform cannot always deliver everything that its customers desire ('that's how it is'). This conclusion implies a transformation of habits at the demand side.

The outcome of this privileging process – and several other instances where participants discussed the same topic – is reflected in the description of the distribution centre in the report on the project (Dessein et al., 2017, p. 41–42 – our translation): *'The platform does (at least initially) not provide a full range of products, but offers seasonal products of producers that are part of the cooperative. This requires flexibility from the customers' side: Not every product is always available – but this is of course intrinsic to working in the short chain business. The challenge, however, is to dispose of sufficient products, both in terms of volumes and variety'*.

5.1.4. Three diverse learning situations

The three analysed events exemplify three very diverse sorts of learning instances that we repeatedly observed throughout the analysed data (see Fig. 4). With reference to the transactional learning theory elaborated above, the lingering gap and undecided outcome of the discussion (inquiry) in Event 1 can be seen as the participants remaining stuck in the problematic situation. They do not succeed in developing a collectively shared definition of the problem how to communicate towards different target groups, they cannot start to experiment with possible solutions that may lead to the (trans)formation of habits and hence they do not manage to find a way out of the problematic situation. In Event 3, the participants find such a way out rather easily with the help of existing habits that remain unquestioned. Through what we have called a 'short learning loop' (Östman et al., 2019a) John's concern that a cook may need non-seasonal food is immediately excluded from the privileging, thus consolidating the habitual belief that working with SFSC implies limiting one's purchases to seasonal food. Here, the disturbance does not result in a process of inquiry. In Event 2, however, such an inquiry does take place. In this 'long learning loop' (Ibid.), the participants collectively manage to find a way out of the problematic situation that emerged through John's comment that he does not have the infrastructure to process food straight from the field. This opens-up potentiality[11] for the (trans)formation of habits, both for the individual participants involved and at a collective level through the designed distribution platform. Through the outcome of this learning process, it becomes possible for John to start a new habit of purchasing SFSC food and for the platform to integrate the new activity of processing food. All the same, also existing habits are consolidated such as John's habit to use convenience food.

[11] Potentiality as in this case the participants are constructing scenarios for potential SFSC niche practices that do not yet exist but that, if realised, will result in changed habits.

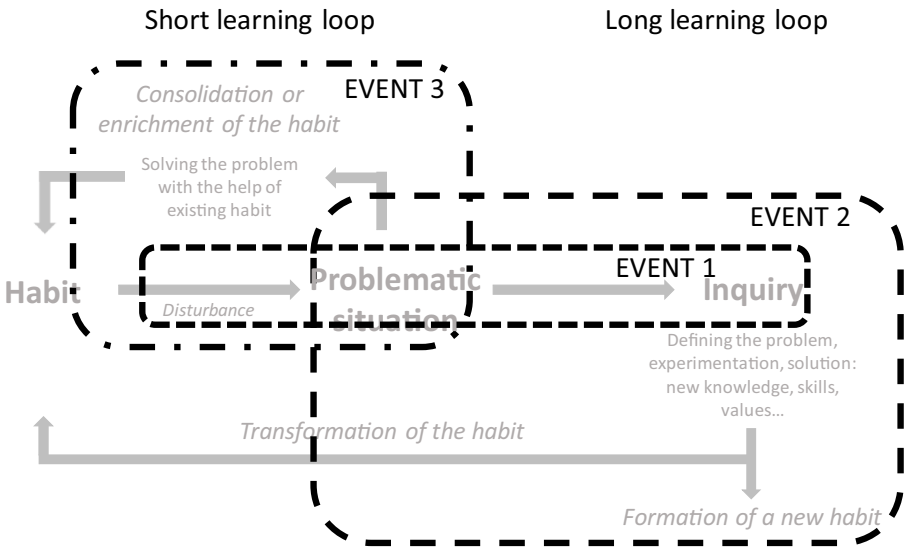

Fig. 4. Three diverse learning situations.

5.2. Step 2: Assessing PEA results from a multi-level perspective on STs

Here, we dig deeper into the results of Step 1 by assessing them from a multi-level perspective on STs. Drawing on existing MLP analyses of the agri-food system, we investigate whether and how ST elements are employed as 'transactional resources' in the learning processes and how they *function* in terms of enabling or constraining a potential transition. Table 4 summarises two sources that we use for this purpose: A recent systematic review of literature about MLP research on STs in agriculture and food systems (El Bilali, 2019) – selected because it provides a broad overview – and an MLP analysis of the agro-food system in the Belgian context with a focus on the city of Ghent (Dessein et al., 2017) – selected because of its close fit to the case studied in this article.

Table 4
MLP analyses of the agri-food system.

Characteristics of the socio-technical regime	▪ Food production and consumption exceed local/urban boundaries and are largely globalised ▪ Industrial farming ▪ Integrated food supply chains ▪ Standardisation ▪ Varied range of ingredients from producers all over the world ▪ Food resulting from all kinds of processing and distribution processes ▪ Market instead of self-sufficiency ▪ Food as a commodity (growth, competition, subjugation to/cooperation with food corporations) ▪ Dominant consumer preferences: purchasing food in supermarkets with a permanently available range of both seasonal and non-seasonal, both local and exotic products ('eternal summer diet') ▪ Control over the method of production is strictly regulated with a concern for quality and public health ▪ Control over control over the origin of our food has been largely relinquished, which comes with a high ecological cost, a dependent position when it comes to food security and neglect of local sources of food production ▪ Knowledge on food production belongs less and less to the culturally shared commonplace ▪ Urban landscape is no longer suited for food production (globalised hinterland) ▪ Ecological costs are externalised
Internal contradictions in the regime	▪ Hunger, malnutrition, food insecurity ▪ Food wastage ▪ Climate change: impact of food production on climate change as well as impact of climate change on food production ▪ Detrimental impact of certain agricultural practices on environmental and soil quality and the loss of biodiversity ▪ Detrimental impact of excessive meat consumption on environmental and soil quality and the loss of biodiversity
Landscape trends	▪ Globalisation, agri-food market internationalisation ▪ Population growth ▪ Climate change ▪ Volatile energy prices ▪ Changing diets and lifestyles ▪ Increasing concerns about animal welfare and the environment: Pressure from citizens

(*continued on next page*)

Table 4 (*continued*)

Niches	■ International treaties and conventions (e.g. Paris Agreement on Climate Change, Sustainable Development Goals, Convention on Biological Diversity, EU Common Agricultural Policy) ■ Poverty, social inequality ■ Fair Trade ■ Organic agriculture, biodynamic agriculture ■ Technological innovations (e.g. cogeneration in greenhouses) ■ Natural resource management agreements with farmers ■ Agro-ecology ■ Alternative food networks ■ Community Supported Agriculture ■ Permaculture ■ Animal husbandry systems ■ Farmers' markets ■ Urban agriculture (e.g. urban gardens) ■ Conservation agriculture ■ Integrated farming ■ Care farming ■ Local niche practices in Ghent, e.g.: B2C SFSC practices, 'Veggy Day', initiatives to avoid food waste
Conclusions of Dessein at al. (2017) regarding the potential of SFSC to result in a ST	■ SFSC is one of the possible strategies that can provide an alternative to the disputed agro-industrial system: the principle of proximity breaks with the societal status quo. ■ Only focusing on SFSC as such will have a relatively limited impact on the existing food regime and might even be welcomed by certain regime players as it may lead to a greater economic return without assuming major changes in current practices. ■ SFSC can be a starting point for a transition under the condition that it is embedded in a broad and well developed food strategy based on a transversal policy that takes into account factors such as a viable income for farmers, preservation of agricultural land, influx of new farmers, social concerns, more sustainable production methods (agro-ecology, organic agriculture), abandoning the 'eternal summer diet', ecological logistics and distribution, etc. ■ The challenge is to remove niches from their current corner of 'amateurism' and 'innocence' and to facilitate an acceleration to fully-fledged, legitimate and mature alternatives with sufficient scale, legitimacy, resources, power and decisiveness.

5.2.1. Event 1: Supermarkets

In the first event that we analysed, Emma and William's struggle over what should be included and excluded in the privileging process can be interpreted as a struggle over the extent to which the platform that they are designing should differ from the currently dominant regime. Both of them utilise transition elements as a transactional resource in their argumentation, yet very different ones. William repeatedly refers to the dominant consumer preferences of purchasing food in supermarkets (line 2, 6, 8, 10, 16) who, in the current regime, have a market advantage and are able to sell food at cheap prices (line 12) as ecological costs are externalised. Emma, on the contrary, repeatedly highlights that there is also a group of people that does not share the dominant consumer preferences but that has developed niche consumer preferences and habits (line 3, 5, 7). They avoid supermarkets and buy food that is not produced and distributed through large-scale, intensive agriculture and retail but, instead, grown at places like Emma's organic farm and sold directly to consumers. As to the latter, Emma uses a niche practice, i.e. her farm's SFSC shop, as a transactional resource in her argumentation (line 13).

Emma's interventions try to steer the privileging regarding how the platform should be designed in the direction of a niche practice that radically differs from the existing regime. William's interventions, on the contrary, try to steer the privileging in the direction of adapting to dominant consumer preferences and collaborating with incumbent actors like supermarkets. The outcome remains undecided.

5.2.2. Event 2: Kitchen infrastructure

In the second event, John uses regime characteristics as a resource in his transactions with the other participants. The widespread custom to use food that has undergone all kinds of processing influenced the infrastructure of large kitchens and thus created path-dependency. Policies that made personnel costs very high in comparison to the cost of ready-to-use food made that large kitchens today no longer have the staffing for purchasing fresh food straight from the farmers' fields. As we see in the PEA analysis, these regime characteristics become something that is privileged as important to take into account. As such, in this transactional event it *functions* as a lock-in leading to creating a very specific suggestion to overcome the problematic situation: Processing of the harvest can be an activity of the distribution platform. One could be sceptical about this learning outcome's potential to facilitate a ST as it involves a proposal *adjusted* to the existing regime and, hence, the consolidation of the cooking habits in large kitchens. On the other hand, however, depending on how this activity is given shape (e.g. with sheltered employment, seasonal food, organic agriculture, avoiding disposable packaging) the proposal might also become a potential lever to bypass the path-dependency and to make it possible that considerable additional volumes of food are traded more sustainably, thus opening-up potentiality for the reconfiguration of the

regime. After all, what is needed for a transition is not only practices, cultures and structures that are profoundly different from the regime in the aspects where the latter is unsustainable, but also niche innovations with sufficient legitimacy, maturity and scale.

5.2.3. Event 3: Seasonal food

In Event 3, John argues that the platform must be able to always deliver the products that their customers desire (line 1). To make this claim, he takes the currently dominant consumer preferences ('eternal summer diet') for granted and refers to a characteristic of market practices in the current regime (a permanently available range of both seasonal and non-seasonal products) that are in line with these preferences and that should, according to him, be mirrored in the scenario they develop. Hanna and Paul, on the contrary, argue that short chain implies breaking with these regime characteristics (line 2–4). Their conclusion implies that the platform's customers will need to adapt their preferences and develop habits that differ considerably from unsustainable routines. As to the potential to enable or constrain a ST, the explicit choice for abandoning the eternal summer diet contributes to providing an alternative to the disputed existing food regime. However, much also depends on other sustainability criteria (a viable income for farmers, preservation of agricultural land, more sustainable production methods, ecological logistics and distribution, etc.) and – here too – on the question whether or not such a niche practice succeeds in reaching sufficient scale to realise a substantial impact on the total volume of food that is produced and traded.

6. Discussion

The methodology presented in this article is designed to address the questions what and how people learn while trying to tackle sustainability problems and what is the potential of these learning processes in terms of fostering STs. It aims to overcome shortcomings identified in existing research on the topic, particularly the neglect of well-established learning research and the failure to acknowledge the complexity of transitions. By introducing pragmatist didactic theory and analytical methods and applying it in combination with the MLP we took into account both concerns. The research design resulting from this makes a vital analytical distinction between, on the one hand, learning and, on the other, changes in socio-technical systems that (may) constitute a ST. After all, STs are never solely the outcome of learning processes. Many other phenomena are at play: Changing policy measures, evolving economic incentives, disruptive external landscape developments, shifting power relations, etc. The analytical approach presented and applied in this paper explicitly treats learning and change as two *distinct* phenomena that, however, can emerge intertwined in the practices we study. We believe that making this distinction and designing research methodologies that allow to operationalise it is crucial in order to avoid the conceptual haziness and confusion of the process and outcomes of learning that we have problematised in the introduction. This is a prerequisite for enabling investigations that can provide much-needed empirically grounded knowledge on the topic. It treats the question whether/what/how people learn while trying to contribute to STs as a genuinely *empirical* question that can only be answered with a focus on the phenomenon of learning as being distinguished from the phenomenon of socio-technical change. The link between both is addressed in the second analytical step by assessing the transition potential of the investigated learning processes.

The presented analytical approach enables researchers to create new knowledge about the role and potential of learning in the making of STs. Our analyses provide insight in how learning can be triggered by a disturbance of habits and induce changes of habits. This is particularly the case where we identify 'long learning loops' like in Event 2 that shows how an inquiry can result in a transformation of the habitual purchase practices of large kitchens as well as the creation of new possible practices of the distribution platform. The analysis offers empirical evidence and insight into how learning can indeed be important for overcoming path dependency (here embodied in the infrastructure of large kitchens), developing shared plans and collective problem-solving (for/in the distribution platform) and the development of niches that are sufficiently mature (e.g. regarding scale) to provide an alternative for regime practices – all important motives why learning is regarded vital for STs that are mentioned in Van Poeck et al.'s (2020) and Goyal and Howlett's (2020) reviews (see introduction).

The analysis of this event does not only show *that* and *what* the participants learn, but also *how* this is facilitated. What we see here is how the facilitators' intervention (Table 2, line 8) plays a crucial role in the outcome of the learning process. She performs a 'specifying move' (Östman et al., 2019b) that makes the participants specify what it is that would still be possible in large kitchens, despite the infrastructure functioning as a lock-in. The result of her intervention is that William re-actualises earlier experiences that allow to fill the gap. Conducting a multitude of such analyses in diverse settings and comparing similarities and differences will enable us to identify patterns that can deliver empirically grounded, generic knowledge on enabling conditions for learning to contribute to STs beyond the particularity of a specific case (Köhler et al., 2019). Such knowledge addresses an important empirical blind spot in current research (Van Poeck et al., 2020 – see introduction). It also has practical relevance as it reveals for organisers and facilitators of transition initiatives where there is space for intervention and which strategies ('moves') can be employed to try to influence the privileging and, thus, the learning process.

Gaining insight in such enabling conditions can go hand in hand with progressing knowledge on obstacles to fruitful learning processes and, more importantly, on how to overcome these. Impediments identified in earlier research are for example difficulties to deal with disagreement and insufficient space for exploring the issues at stake (Van Poeck et al., 2020). In Event 1 we indeed found the participants remaining stuck in a problematic situation as their inquiry does not result in dealing fruitfully with disagreement. What we also observe in this conversation is the absence of facilitator interventions. Gaining more insight in *what can be done* to facilitate learning (by identifying the above elaborated patterns) and making comparisons with *what is done* in specific events will deliver useful knowledge. In this particular event, it can reveal possibilities to encourage participants to employ in a more fruitful way the articulated transition elements (e.g. niche consumer preferences) in order to find a way out of the problematic situation. Identifying effective 'reorienting moves' (Östman et al., 2019b), for example, delivers insight in how a facilitator can redirect the privileging from marginalising niches by

referring to an insufficient scale towards an inquiry into possibilities for niche maturation. Similarly, fruitful ways to create space for exploring issues can be identified. This could be particularly relevant in relation to our analysis of the transition potential of the learning outcomes in Event 2 and 3. It appears impossible to predict whether or not these outcomes will result in a ST. Yet, what can be done is to identify possible interventions that a facilitator can employ in order to increase that potential. For example, fruitful ways to make the participants articulate and specify additional sustainability criteria for the newly suggested activity of the platform (Event 2) or to make them explore possible pitfalls involved in ignoring dominant consumer preferences and looking for ways to prevent them (Event 3).

Our analytical approach, inspired by pragmatism's 'insistence on the human potential to "make a difference"' (Shilling, 2008, p. 4) can thus help to reveal manifestations of 'agency' in STs (Smith et al., 2005; Geels, 2011) by clarifying the role of learning in how change is *made*, in action, in people's day-to-day practices. The open-endedness and long-term character of STs make it unfeasible to determine direct, linear and causal links between the learning taking place in these micro-level practices and the emergence of major societal transitions. We are forced to focus on the only research object that we have access to: Practices actually taking place here and now. These are also the only available locus of intervention for those who want to influence or accelerate transitions-in-the-making. After all, even though societal transitions are macro phenomena, they are always constituted of (a multiplicity of) actions at the micro level (Geels, 2020): Learning practices but also, for instance, political struggles, development of legislation or resource allocation and investment.[12]

7. Conclusion

We have presented a methodology that can be applied to overcome important gaps in existing research on learning in STs by creating empirically grounded knowledge on what and how people learn while trying to tackle sustainability problems and what is the potential of these learning processes in terms of fostering STs. As illustrated with examples from a case study, it enables us to reveal how learning can contribute to overcoming path dependency, to creating shared plans and collective problem-solving, and to developing niches with the potential to provide an alternative for non-sustainable regime practices. Furthermore, it makes it possible to gain insight in and offer empirical evidence of how the interventions of organisers and facilitators of transition initiatives affect the outcome of learning processes. We have argued for applying the analytical approach in empirical studies in diverse settings in order to deliver empirically grounded, generic knowledge on enabling conditions for learning to contribute to STs by identifying patterns beyond the particularity of a specific case. Providing suggestions for further research, we have addressed the presented methodology's practical relevance in terms of revealing space for intervention, identifying effective strategies to try to influence learning processes and gaining insight in enabling conditions for fruitful learning processes and ways to overcome obstacles to it.

Recognising the challenges involved in designing and conducting such research, it is fair to conclude this article by emphasising that the presented study does absolutely not pretend to provide all the answers. In fact, it rather raises a lot of new questions and hypotheses that require further study. Substantial and very challenging work remains to be done to trace connections between learning processes, outcomes of learning and (potential) STs over time. Longitudinal studies, across many instances and settings, on learning processes as well as associated transitions-in-the-making are needed. The presented methodology thereby allows to identify links between creativity and change (privileging shifts in the collective meaning-making, educative moments, etc.) at the micro level of the studied practices on the one hand and creative change at the macro level (e.g. new dominant customs, changes in essential regime characteristics, maturation of niches, acceleration of emerging transition) on the other. We may find, for example, connections between new visions of the future created through and in collective learning processes, and emerging shifts of dominant discourses. Or between a fruitful combination of complementary knowledge and skills in these practices, and the origin of an important technological innovation. Or between the disruption of taken-for-granted value judgements in the collective learning processes and an acceleration of changes in policymaking and regulations. Etc. In the presented explorative case study, our empirical object has been episodes of learning delineated in time and space – i.c. the workshops. Each case study will contain many of such episodes. In order to create sophisticated knowledge and empirical evidence of how learning can contribute to transitions-in-the-making, what needs to be done is to investigate the whole chain of episodes within each studied case (i.c. for example what happens after the workshops when the distribution platform is implemented), as well as comparisons between such chains across diverse cases. This involves analysing and describing longitudinal 'learning pathways' by identifying continuity and discontinuity between patterns found in the investigated episodes (see above), as well as mapping and describing relations between these learning pathways and 'transition pathways' (Geels and Schot, 2007). It is our hope that the analytical approach presented and illustrated in this article may inspire more research on the topic in varied settings and contexts.

Declaration of Competing Interest

The case studied in this article concerns a research project conducted by colleagues of the first author at Ghent University.

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[12] Micro-practices are not only situated in niches but also in day-to-day regime practices.

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Appendix 1. Extended tables PEA

Event 1: Supermarkets

		Conversation	Relations	Effect on privileging
1	Emma	Maybe we need to make a distinction in quality of carrots or so… I think… Quality and price, that we make a difference. Quality carrots from open ground and large scale carrots.	Distinction in quality of carrots – difference in price Quality carrots – open ground Large scale carrots – not – quality carrots	Inclusion of the distinction in quality of carrots as a legitimate criterion for a difference in price in the privileging
2	William	But everyone buys their vegetables in [names of 4 supermarkets]. And everyone likes them ...	[Large scale carrots]* – supermarkets – but everyone buys and likes them	Exclusion of the relation 'large scale carrots – not – quality carrots' as a valid criterion
3	Emma	Yes, but not me ... For example	[Everyone buys and likes them] – but not me	Exclusion of William's claim that 'everyone buys them' as a valid argument
4	William	Yes, but you are an		
5	Emma	[interrupts] I am an exception, but I think that group is growing.	I am an exception – but that group is growing	Inclusion of a new claim: there is a growing group that does not like to buy large scale vegetables in supermarkets
6	William	But let's say, the mainstream person goes to the store, buys his vegetables there. … And they eat it and they like it.	[Growing group] – but mainstream persons buys vegetables in stores and like it	Exclusion of the claim that the group is growing: it is too insignificant in scale to take this into account
7	Emma	Yes, but I think that group is changing. For example me, I don't go to the supermarket anymore. It's a choice, because I can't find what I am-	Mainstream persons – that group is changing – for example me – it's a choice	Re-inclusion of the claim that the group is growing
8	William	[interrupts] Yes, but there aren't that many	[Group is changing] – but there aren't that many	Weakening of the claim that the group is growing by re-including the argument of insignificant scale
9	Emma	No.	[There aren't that many] – no	Inclusion of the claim that there aren't that many'
10	William	What percentage of the population?	[Group is changing] – what percentage of the population	Strengthening and specifying the argument of insignificant scale
11	Emma	Yes, but you can make a choice in that distribution platform. That choice exists, that option … that you say I … want *that* carrot, that you can choose that.	[There aren't that many] – but you can make a choice in the platform – you can say I want *that* carrot	Inclusion of a possibility: the distribution platform can choose to address the growing though not mainstream group that wants quality carrots
12	William	Then you come back to my story, right, that maybe that supermarket should offer that, because you will never be able to offer it at the same price. It will be a big difference if you have someone who delivers twenty kilos of carrots or someone who says I can supply you with ten tons of carrots, I can set up a production machine for that and in the end it costs ten cents less per carrot. It is, I put it bluntly, but do you understand? So for many, a lot of people, even for many families, the price will be incredibly important. And much more than you think, I think. And, and you are going to be willing to, I am also willing to pay more.	[*That* carrot] – supermarkets should offer that – you will not be able to offer it at the same price – for many people the price will be incredibly important – much more than you think	Counter-inclusion of another possibility: supermarkets can offer quality carrots cheaper
13	Emma	But we have now started a shop with our vegetables and that works. The prices are more expensive, but people buy there and it keeps getting better and better and better. So there's an audience for that. And our range of products is much smaller so I think, the range is smaller the price is higher so maybe that works?	[For many people the price will be incredibly important] – we have started a shop with our vegetables where prices are more expensive – there's an audience for that – maybe that works	Re-inclusion of the possibility raised in line 11 with the argument that the store they started shows that it works
14	William	I believe that. I believe immediately.	[There's an audience for that] – I believe that	Inclusion of Emma's argument

(*continued on next page*)

(*continued*)

15	Emma	Maybe that works, if we make a distinction there.	[Maybe that works] – make a distinction	Re-inclusion of Emma's initial distinction (line 1) as a legitimate criterion
16	William	But we are going, we cannot estimate your volume of customers right? Well, despite the fact that it works better and better and that there are many people who are aware of that, we can, well yeah, that's not even 1% of any [supermarket].	[There's an audience for that] – but we cannot estimate your volume of customers Growing group – but not even 1% of any supermarket	Re-exclusion of Emma's claim that there is a growing audience for more expensive quality vegetables (line 5) by re-including the argument of insignificant scale (line 6 and 8)
17	Emma	But we are not talking about supermarkets now, right?	[Not even 1% of any supermarket] – we are not talking about supermarkets now	Inclusion of a distinction between supermarkets and what they are developing in the scenario workshop

The brackets [] indicate the elements of the constructed relation where the participants refer back to something that has been uttered before the line in which the relation is constructed – either by another participant or by themselves.

Event 2: Kitchen infrastructure

		Conversation	**Relations**	**Effect on privileging**
1	John	For example we buy… I don't even have the space in my kitchen where I can peel potatoes. I don't have that anymore. I no longer have a space where I can process my vegetables. I *did* have that 20 years ago.	[Supply of non-processed vegetables] – no space in my kitchen to process vegetables – I did have that 20 years ago	Introduction of a concern
2	Eric	Yes yes yes yes I understand that.	[No space in my kitchen to process vegetables] – I understand that	Confirmation of John's concern as something that should be taken into account
3	John	For example, 20 years ago apples were peeled with four people sitting at the table, outside in the sun, with a cup of coffee and the radio on. … That was apple sauce. Now this would cost 1000 francs [= €25] per litre. That is no longer possible. That all disappeared right. …	Peeling apples with four people – would cost 1000 francs per litre – no longer possible	Strengthening and further specifying the concern with an extra argument: also the cost is to high
4	Eric	Yes, that is what I mean by stepping back in time. If you only…	[No longer possible] – stepping back in time	Attempt to include an earlier made suggestion to step back in time
5	John	But you can't do that anymore, you can't reverse that. Well, certainly not on, on, on… mass distribution. That's not possible.	[Stepping back in time] – you can't reverse that	Exclusion of Eric's suggestion as being impossible
6	William	Not entirely, but there are some opportunities.	[You can't reverse that] – not entirely – but there are opportunities	Partial inclusion of Eric's suggestion: although it may not be entirely possible, there are some opportunities
7	John	There are certainly some opportunities. There are some products that are certainly not a problem. For example salad, chicory and so on. That's not too much work. But it's about those other things.	[There are opportunities] – for some products – not for other things	Strengthening and specifying William's claim that there are opportunities
8	Facilitator	And what opportunities do you see in it? …	[There are opportunities] – which ones?	Encouragement to further specify the claim
9	William	I know a farmer who says … I have an agreement with two hospitals that I deliver to and all my harvest goes there and I have a much better price.	[Which opportunities] – farmer who has an agreement with hospitals	Strengthening and specifying the claim with an example
10	Eric	But is that also processed in the hospital, that entire harvest?	[Farmer who has an agreement with hospitals] – is the harvest processed in the hospital?	Re-inclusion of the initial concern (line 1)
11	William	He works with a factory to peel it. … but I am just saying: that peeling could for example be included in that distribution platform.	[Is the harvest processed in the hospital?] – a factory peels it – the peeling could be included in the distribution platform	Introduction of a new possibility

Event 3: Seasonal food

		Conversation	Relations	Effect on privileging
1	John	But, but I think it's important when you organise such a platform, it is short chain coming from local merchants, but if a cook says one day … erm in June, I need red cabbage here today and then you don't have a single farmer in all of East Flanders who currently has red cabbages that he can get, that the platform must then be able to deliver it.	[How to match supply and demand?] – a cook needs red cabbage in June – platform must be able to deliver it	Introduction of a claim
2	Hanna	But I think if you go for short chain, then actually, that's how it is … Short chain is also seasonal, in the end, right? So in June you will indeed not be able to find red cabbages at a farmer's, you can have that in the winter, but not in the summer right. So that's uh -	[Farmers in East Flanders do not have red cabbage in June] – that's how it is if you go for short chain – short chain is seasonal	Exclusion of John's claim with the argument that short chain is seasonal
3	Paul	Then it's asparagus.	[Farmers in East Flanders do not have red cabbage in June] – then it's asparagus	Strengthening and specifying the counter-argument with an example
4	Hanna	Yes, yes, that's how it is.	[In June it's asparagus] – that's how it is	Repeating and strengthening the counter-argument

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