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ORIGINAL ARTICLE

Harnessing concepts for sustainability: a pledge for a practice

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Abstract
The high creativity at play in sustainability science and practice gives rise to a wide variety of concepts, each trying to promote new lines of thinking and action. Successful concepts may become true imperatives within professional circles or may even become buzzwords, often losing their ability to convey a well-defined meaning for all their users. The concepts at stake, known as "thick concepts", are conveying values and inspiring action. As such, they are key in spurring or supporting collective action. However, the actors endorsing them may ascribe very different consequences behind their use. In the inter- or transdisciplinary endeavors that are the backbone of sustainability science, the polysemy or diversity of interpretation of those concepts may pose particular problems. Indeed, this lack of clarity is further amplified by the diversity of backgrounds of collaborators, which already makes communication and the common understanding of actions a daily challenge. Anchored in pragmatist philosophy and more precisely drawing on inferentialist theory of concepts, this paper is a pledge for the conscious and practical mobilization of concepts within inter- and transdisciplinary collaborations, proposing a framework to this end. It aims at exposing to a wide scientific and practitioner audience the nature and roles of thick concepts and the philosophical bases of their analysis. It then deploys the main lines of the practical implementation of concept analysis and operationalization for teams of researchers and practitioners, based on the experience gained through its mobilization in a postgraduate master anchored in the One Health approach.

Keywords Complexity · Transdisciplinarity · Methodology · Pragmatism · Inferentialism · Creativity

Introduction

In a recent joint statement, a group of philosophers clearly made the point about the manifold contributions that philosophy can bring to sustainability science (Nagatsu et al. 2020). As proposed by these authors, the envisioned inputs of philosophy hinged on two main areas of work: one on concepts and the other on normativity and values. Two years earlier, Maher et al. (2018) also highlighted the foundational role of integrated conceptual frameworks in overcoming barriers to sustainability, together with visual communication and online networks. The present paper illustrates and explores the area of conceptual work as a practical support to inter- and transdisciplinarity, proposing a structured approach to that conceptual thinking and its strategical use.

This reflection emerged from the implementation of a postgraduate 1-year master program on the integrated management of health risks that started in the academic year 2016–2017 (Sidikou et al. 2022). Promoting a One Health approach under a paradigm of complexity (Zinsstag et al. 2015), this program is developed in accordance with major features of sustainability science (Sidikou et al. 2022), i.e., (a) using a participatory process in knowledge production and decision-making, (b) addressing complex systems that necessitate an inter- or transdisciplinary approach, and (c) being action-oriented (Kates 2011; Nagatsu et al. 2020). The One Health approach integrates concerns for human, animal and environmental health, highlighting their strong interdependence. Thus, it forms an integral part of sustainability science in the sense that it seeks the ways to a shared well-being of life forms on earth.

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In that master program, a course was developed to introduce a "conceptual approach to health management" in close collaboration between the two authors of the present paper, i.e., a veterinarian by training (NAM), approaching One Health issues (food security, antimicrobial resistance, and emerging diseases) with a socio-economic lens (Antoine-Moussiaux 2018), and a philosopher (SL) also trained in biology, applying a pragmatist thinking to concerns of equity and social justice in human development. Initially, thought as a general introduction to the main concepts mobilized around the integrated management of health risks, the continuous elaboration with the students turned the course into a structured approach to inter- and transdisciplinarity underpinning the elaboration of their team-based fieldwork (subject to their master thesis). Aimed at professionals from public and animal health, the course was developed with a constant concern for its practical implementation by students in their respective endeavors.

In this paper, we analyze the need and propose a framework for conceptual work in sustainability practice, and delineate tracks for its implementation in the field. The first section exposes the rationale to focus on concepts in sustainability science and practice. The second section brings fundamental elements of a theory of concepts on which the approach is based. The implementation steps are then described in the third and fourth sections.

Rationale: concepts in action

Sustainability science, complexity, inter- and transdisciplinarity: when good practices fall short

Sustainability science is primarily use-inspired and action-oriented (Kates 2011). Yet, talking about concepts is often perceived as taking us far from practice, as if both were opposite. Indeed, practitioners will not feel the need to conceptualize about their practices, as long as "good practices" and well-trained competencies are obviously working well in the field. However, when it comes to organizing a collective action facing complex issues, as tackled under the One Health approach or for sustainability issues in general, "good practices" fall short of providing satisfactory results. Complexity, due to its share of uncertainty and surprises, calls for an adaptive strategy facing disturbing events and unexpected impacts (Snowden and Boone 2007). Therefore, to guide the multiple decisions to be made, one will feel the need to rest on some beacon and landmarks. The present proposition is that a well-conducted conceptual analysis can provide this needed guidance of a work within a paradigm of complexity. In the wide range of possible actions and strategies, such a guide will help us define the subset of actions that would be feasible, efficient, and coherent with our understanding of the situation and the goal.

Practice in the face of complexity thus reveals its conceptual nature. The way we act in our daily practice directly derives from the way we "conceptualize" or frame the issues, the goals and the tentative solutions. Most of the time, this conceptualization or framing is kept tacit and professionals abide by the good practices that are derived from this tacit way of understanding an issue. When good practices are facing their limits or conflicting with other good practices, from other sectors, professions or disciplines, the conceptualization needs to be made explicit again in order to be thought afresh.

Those conceptualizations are expressed through words, often intervening as professional imperatives: stewardship, empathy, resilience, integration, participation, etc. Such imperatives might even become buzzwords, often used and seldom defined, hence losing their ability to convey a well-defined meaning for all their users [see for example, the analysis of the use of knowledge-related concepts in sustainability science by Apetrei et al. (2021)]. At this step, analyzing the content of the concepts becomes crucial to keep their functionality, i.e., their ability to underpin and orient collective actions. We need to know what ways of framing problems and solutions are conveyed through these words, in order to be able to implement, adopt, adapt or reject those, and to follow up whether we are doing well and obtaining the right effects. Therefore, those terms appear as good candidates for a thorough critical analysis for a team that is motivated to "make these principles work", operationalizing them and recovering a sense of ownership of those terms.

Besides that need for adaptation and innovation, complex issues also call for involving multiple disciplines, harnessing the needed diversity of expertise and perspectives (Cilliers et al. 2013), pointing to the need for inter- and transdisciplinarity (Jahn et al. 2012). Yet, this practical importance of words' meaning appears all the more crucial in such teams gathering people from multiple disciplines or professions. Indeed, because disciplines use different words for close realities or the same words for very distinct ones, language poses many traps to inter- and transdisciplinary communication (Wear 1999; Baccini and Oswald 2008). The success of some buzzwords in health management or sustainability science makes the problem worse because it creates true struggles to be the keeper of the "right definition", even more if those words are made central in calls for applications and become key to access funding. Indeed, our professional jargon is crucial in structuring our thinking, actions and even our professional identity and legitimacy. Therefore, many inter- and transdisciplinary teams will have experienced the need to spend a considerable time talking about terminologies, sometimes never coming to an agreement. These words that are subject to ever repeated discussions are not

simple "daily-life" univocal words but cover sophisticated thinking and refer to wider frameworks in which they are embedded. These words convey a way of seeing the world; hence, those are called here "concepts". These concepts are important to each professional because they entail practical consequences. Therefore, methods are needed to help them making these consequences explicit, shareable and debatable within interdisciplinary teams. The practice of mobilizing concepts thus deserves being taught as such to future practitioners of any life or technical science to help them work within the inter- and transdisciplinary settings of sustainability challenges.

Concepts to build collective action

Organizing a collective action presupposes that the stakeholders agree to a certain degree about the characteristics of the situation, about the change that is desirable, and about the way to respond to the situation and implement the change, i.e., the system, target and transformation knowledge as mobilized in transdisciplinary frameworks (Pohl and Hirsch Hadorn 2008). That is, the stakeholders should share some beliefs (about the situation and about what is appropriate to do) and desires (about what has to be changed) that determine the action to be taken. Beliefs and desires are structured by concepts, which are the building blocks of thoughts. Therefore, a genuine agreement about which action to take presupposes a common understanding of the concepts that structure the decision-making thought.

For instance, the collective decision "to organize a participatory workshop to understand in which respect the well-being of a community is impacted by an environmental health hazard" is reached on the basis of desires (e.g., to avoid well-being predicament) and beliefs (e.g., that a participatory approach is a preferred way to understand the community well-being) whose "building blocks" are concepts (e.g., participation, well-being, and health hazard). If stakeholder *A* understands the concept of "participatory approach" in a different way than does stakeholder *B*, the agreement they are reaching to organize a participatory workshop will be fake: *A* and *B* have different concrete actions in mind.

Three type-roles of concepts in action

Concepts that are central to a decision may hold different roles in the thinking. We propose to distinguish between "problem", "goal" and "principle" concepts, and mobilize this distinction in animating the collective thinking work. Referring to the previous example of the collective decision "to organize a participatory workshop to understand in which respect the well-being of a community is impacted by an environmental health hazard", health hazard appears as the problem, well-being as a goal to reach, and participation translates principles that our action should follow.

Examples of problem concepts may be vulnerability, poverty, precarity, or disability. Discussing about specific contents of such problem concepts will help share a common understanding of what is practically at stake (the problem to be tackled): it helps to frame and express the problems, unravel the values at stakes, acknowledge the positive value-laden nature of concurrent propositions and lead to explicit agreements about what can be done: a sequence that follows what Ansell and Geyer (2017) schematize as being a typical pragmatist enquiry in policy-making. This need to open the black box of problem framing to foster collaboration has been pinpointed in the One Health community, with a particular role of the concepts of "nature" and "environment" (Antoine-Moussiaux et al. 2019).

Goal concepts, such as resilience, sustainability, or capability, operate as a positive expression of a desired state or quality of future reality. Their specific content will inescapably entail positive value judgments. Through their positive framing, such concepts will be key to sharing the "target knowledge" in transdisciplinary research projects (Pohl and Hirsch Hadorn 2008). A shared understanding of these concepts will be central in all foresight-based methods of planning, to depict the targeted state of the world (e.g., Andreotti et al. 2020).

The last proposed category of principle concepts, e.g., equity, participation, or social justice, may be thought of as rather qualifying the processes to be followed while tackling a problem and pursuing a goal.

This typology is proposed for an analytical use, helping teams to consider the type(s) of concepts around which they have to discuss in detail. Indeed, in their practical use, a same concept might hold different roles and act in a case as a principle concept while in another case it will act as a problem or a goal concept. Ascribing one or the other role to a concept will thus also result from a decision of the teams. A proposed practice is for the team to describe the envisioned approach by coining a sentence using the three concept categories: problem, goal and principle.

Reflecting about concepts: some useful philosophical insights

Concepts and conceptions

When using concepts to communicate our beliefs, intentions or desires, we usually presuppose that our interlocutors share the content we give to those concepts for the good reason that we and our interlocutors obviously share *part of* the content, allowing for communication about a "state of the world" the concept refers to. However, in many cases,

people have different fine-grained understandings of a same concept. Talking for example, about "poverty", two people may understand each other on general considerations about it but disagree when it comes to deciding whether one given household must be considered poor or not, or to deciding what should be done first to alleviate that state of poverty.

Let us first note that, as concepts are expressed by words, one can consider that the content of a concept is given by the meaning of the word that expresses it: to share the content of a concept is to share the meaning of the word expressing it.

For a category of words, there is no problem of common understanding, or at least, if there is a problem, it can usually be easily solved. Take the word "hammer". The truth, or the falsity, of the sentence "this is a hammer" is determined by the state of the world it refers to (an artifact with such characteristics and functions) and by the linguistic rules shared by all members of the English linguistic community. If I use the word "hammer" to designate what all other members of the English linguistic community call "door", I use different linguistic rules and doing so, I exclude myself from the English language community in the sense that I can no longer communicate within it (about hammers and doors, at least). The problem of misunderstanding can be solved by checking the English language rules, which one can find in a dictionary.

But for another category of words, the matter is more complicated. Take again the word "poverty". The truth, or the falsity, of the sentence "this household is poor" is determined by the state of the world it refers to (a household with such characteristics), by some linguistic rules shared by all members of the English language community, *and* by some other judgments or criteria not necessarily shared by all members of the English language community. Shared linguistic rules determine a *general* definition of poverty, e.g., "state of those not having the means to procure necessaries of life" (see *The Concise Oxford Dictionary*), whereas additional judgments or criteria determine *specific* definitions, that is, specifying what are the "necessaries of life" and the "means" those people lack (e.g., a given quantity of material goods, or social respect, or capabilities to do something). Defining poverty is *not only* a matter of shared linguistic rules. It implies additional criteria, which can be divergent among members of a same linguistic community. The specific definition determines to which concrete state of the world the term refers: according to one specific definition, "poor" refers to the situation of people lacking material goods; to another one, it refers to the state of someone lacking social respect (Leyens 2014).

Let us now translate this into the domain of concepts, using the distinction between "concept" and "conception" (Rawls 1971). The content of the *concept* of poverty is given by the general definition of poverty (e.g., not having the means to procure necessaries of life). While different people will agree on this content of the concept, they might disagree about what are those "means" and what are the "necessaries of life": they defend different *conceptions* of poverty. It is important to notice that it is the specific content of concepts, i.e., the conception, which determines the decision-making.

Many concepts have this two-layer structure. Besides "poverty", concepts such as "development", "benevolence", "resilience", "adaptability", or "prevention" are of the same type. Without any doubt, we share the general content of those concepts and when we communicate about them, we understand, to a certain degree, what we are talking about. However, we have divergent conceptions of what those imply concretely. Hence, those concepts (e.g., "poverty") have a *general* definition, on which there is a (broad) consensus within a linguistic community, and a *specific* definition, which can be an object of disagreement and debate within a community sharing the same linguistic rules.

Thick concepts: description and prescription

Some of those two-layer structured concepts have another characteristic which is worth emphasizing. Let us consider again "poverty". On one hand, to say that a given state of the world is a case of poverty is to give a *description* of a state of the world; or, to put it the other way round, this given state of the world calls for the application of the concept. On the other hand, the application of the concept of "poverty" to a state of the world gives someone a reason to act because "poverty" holds a *prescriptive* dimension: to say that a situation is a situation of poverty is to say that one should do something to improve it. "Poverty" includes a negative value judgment. Such concepts have both a descriptive and a prescriptive dimension: they are "thick concepts" (Williams 1985)—on the contrary, "hammer" and "door" are "thin concepts" as they have only a descriptive dimension and do not bear any value about the state of the world they describe.

The prescriptive dimension of thick concepts is binary: a thick concept implies either a positive value judgment, or a negative value judgment. As we have just seen, to apply the concept of "poverty" to a situation implies judging this situation inappropriate and recommending to change and improve it. On the contrary, to apply the concepts "prosperous" or "human flourishing-apt" to a state of the world amounts to recommending and to favor this situation or state of the world.

The concepts prone to spurring a collective action are typically thick concepts. Their prescriptive dimension is indeed key in mobilizing people. Thick concepts (e.g., "poverty"/"prosperous") have indeed type-roles (in this case, type-role "problem"/"goal") *by virtue of* their prescriptive dimension that implies a negative/positive value judgment (saying that some state is *poor* is to imply that there is a *problem* to be solved/our *aim* should then be to make this

state *prosperous*). Let us note that only thick concepts have these roles; thin concepts such as "herd", "watershed" or "household" are lacking the prescriptive dimension necessary to be considered as "problem", "goal", or "principle".

A major difficulty with understanding thick concept is that sharing the general content (the concept) can make us believe that we share as well the specific content (the conception), which may not be the case. Indeed, because two people share a *general* description (poverty *is* the lack of what is necessary for a decent life) associated with a prescriptive dimension (poverty *should* be eliminated), they might *falsely* think that they share the same *specific* description associated with the negative prescriptive dimension—falsely, for one thinks that eliminating poverty is eliminating the lack of commodities available, while the other thinks eliminating poverty is eliminating the lack of capabilities. To reach a genuine agreement on what collective action to take, stakeholders need to make explicit the specific content of concepts because it is the specific contents that determine which decision will be made and which action is to be taken.[1]

Making conceptual content explicit

It is far from being obvious that all stakeholders have a clear insight into the specific meaning that they are giving to a concept, that is, on the conception they have. Making explicit what stakeholders implicitly mean when using a concept is an essential stage of inter- and transdisciplinary works. To understand and frame this stage, some more insights from philosophy are needed.

To propose tools and methods to reflect collectively about specific conceptual content (orconception) in order to understand properly a situation and decide about the adequate action to face it, one should know what specific conceptual content consists in. An interesting approach to understanding specific conceptual content has been developed within the pragmatist tradition under the name "inferentialism". In short, inferentialism is a branch of the "use theory" of meaning initiated by Wittgenstein (1953); it was first proposed by Sellars (1963) and later developed by Brandom (1994, 2000).

To understand a basic specificity of an inferentialist theory of concept, let us start with the idea of classification. Concepts are used to classify our experience of the world. It is important here to make the distinction between *responsive classification* and *conceptual classification* (Brandom 2000). A thermostat responds differentially (on–off) to the world depending on the temperature: it classifies states of the world as (too) hot and cold. This is a responsive but not yet conceptual classification: "hot" has no *meaning* for the thermostat; it does not *understand* what "hot" is; it is *not aware* of the heat. For a response to have a *conceptual content* for someone, one has to understand the statements that are logically articulated or connected to a statement including the concept—such a logical articulation of statements is called "inference". For instance, having the concept of "hot" is to treat "it is hot" as being incompatible with "it is cold" and not following from "it is lukewarm", and entailing "it is a good idea to take off my sweater", etc. The content (meaning) of concepts is not given by an out-of-the-blue definition, but by the inferences, it is articulated with. This conception has consequences on the nature and structure of concepts.

First, to grasp a concept is to grasp many concepts, which are inferentially articulated all together. Inferentialism is a *holist* theory of concepts: to understand a concept ("hot") is to have the practical knowledge of other secondary concepts ("cold", "lukewarm", and "sweater").

Second, using a concept, I am *committed* to the inferences that are constitutive of the content (meaning) of the concept. Those inferences are mostly implicit in the sense that I am not (fully) aware of them. When I use the concept "tree", I am committed to implicit inferences such as "this plant has a trunk, this plant is woody, therefore this is a tree" and "this is a tree, therefore I can burn it". Knowledge of those inferences is never complete; experts in trees (a timberman, or a botanist) grasp better (though never completely) the inferential meaning of "tree" than other people do. The content to which I am committed when using a concept is given by inferences from the *conditions* of its proper application ("it is woody") to the appropriate *consequences* of its application ("I can burn it").

Third, to analyze a concept, that is, to understand its content or to grasp its meaning, is to *make explicit* the inferences that articulate it. By making explicit the implicit inferences articulating the meaning of a concept, I become aware of the specific meaning I give to a concept. When I state that "this household is poor", I should be able to make explicit the inferences that presuppose or imply my statement, such as "it lacks material goods, therefore it is poor" or "it is poor, therefore it cannot contribute to human flourishing". These inferences express the reasons I have to consider a state of the world as poor. By making the conceptual content explicit, I bring it in a rational "game of asking and giving reasons" (Brandom 1994) that justifies my using it—for instance, the reason to say that this household is poor is that it lacks material goods. Analyzing a concept is to become aware of the inferences I am implicitly committed to when using it.

As illustrated in Fig. 1, thick concepts and inferentialism are two philosophical bases that may help us face the

[1] Let us note that these philosophical bases on concept mobilisation had already been introduced in the domain of sustainability science by Jacobs in (1999), talking about "contestable concepts".

Fig. 1 Rationale and main arguments for concept analysis in support to collective action. The figure highlights the connections between the philosophical grounding, the proposed analysis process and the challenges they are trying to solve. Light-gray hexagons express these connections in terms of ways to approach meaning, through practical inferences, dialogue and translation in implementable items. (The graph was realized with www.hexx.it, free online mind-mapping software)

challenge of use of concepts that became too contested or too abstract to be practical. This goes through a process of analysis that is exposed in the remaining part of this article.

Concepts exploration and analysis to inform action

On the basis set out in "Reflecting about concepts: some useful philosophical insights", we propose a sequence of concept exploration and analysis in three movements, which structure is presented in Fig. 2: (i) map and select, (ii) make explicit, and (iii) operationalize. These three movements of analysis, however, must be understood as analytical distinctions referring to three types of operations, and not as chronological moments or strictly successive stages of analysis. In concrete terms, these three operations are intertwined: for example, making a conceptual content explicit can determine the choice or not of a concept; reflecting on the possibility of operationalizing a concept can lead to preferring it, or not, to another; etc. It is this concrete procedure, involving three types of intermingled and sometimes iterative operations, that we present in the following sections.

Choosing concepts

The chosen concept should be meaningful to all members of a team and deemed important enough by each of them to deserve the time of an enquiry. The candidate concepts may be first sought among the description of the problems at stake, the goals or of the main principles of action. It will be recognized as a thick concept, hence entailing some polysemy or diversity in its practical translation as well as positive values, in order to get participants engaged in a constructive debate. The institutional recognition of the strategic importance of a term may weigh in favor of its interest for the team. Hence, concepts to work on may be chosen according to their frequency of use in administrative, operational or scientific frameworks. The interest of opening the box of these concepts will be revealed by external viewpoints, thus needing that other professions and disciplines are invited to contribute.

A concept may also be purposefully imported from other domains of application than one on which the team is working. Such imports may foster inspiration, more abruptly, creating a situation of learning from other disciplines, professions and sectors, in an attempt to give birth to innovative

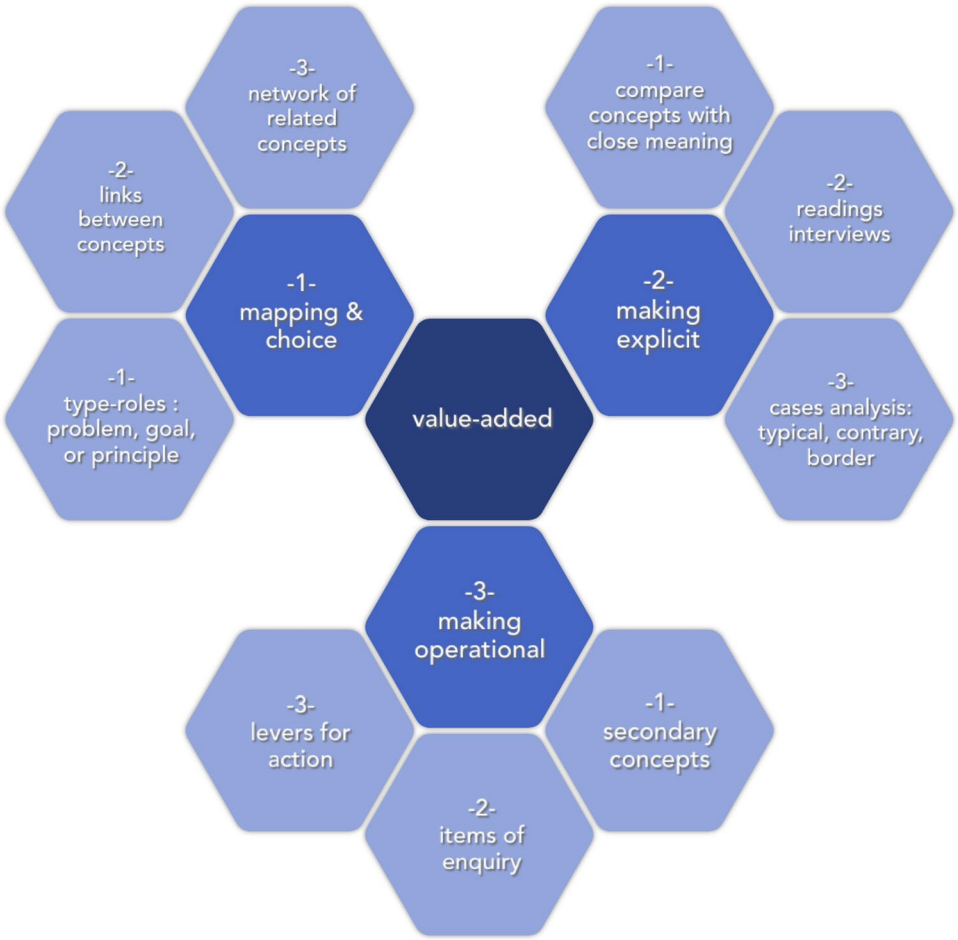

Fig. 2 Steps of concept analysis for collective action. The figure highlights the central role of value-added as a beacon throughout the analysis, from choice to operationalization. The question of practical reasons to mobilize a given concept rather than closely related ones must be central at all steps to ensure that the team is taking full advantage of their conceptual positioning. (The graph was realized with www.hexx.it, free online mind-mapping software)

ideas. In such a process of transplant of a term from other disciplines, terms may be mobilized in a rather metaphoric use (Darbellay 2012). While such a use may be fertile, one should be cautious in the acceptability of this for some team members who could consider it as a lack of accuracy and rigor. In such cases, the link to practical concerns must be clear and bring significant value-added compared to terms already mobilized in the domain.

Some concepts are known for already being used across a diversity of disciplines, known as "travelling concept" or "nomadic concept", an expression first used by Isabelle Stengers in 1987 (Bal 2020; Darbellay 2012; Stengers 1987). Through their travel, these concepts have acquired new meanings and are now translating different viewpoints. Such nomadic concepts are promoted by the Swiss Academy of Science as a facilitating tool for transdisciplinary projects (Rossini 2020). Indeed, being seemingly shared by distinct disciplines, these constitute an opportunity to discuss the rich diversity of their specific contents (conceptions). The intention is then to take advantage of the diversity of insights that each discipline will have aggregated in the shared term. As such, those nomadic concepts are good candidates for the present methodological proposition. The current classical example of such a nomadic and rich concept is that of resilience: adopted across a high diversity of disciplines, it appears that the attraction of its users towards high levels of abstraction tends to drive them away from practical implementation (Thoren 2014). As such, the concept of resilience thus appears as a perfect example of the need for the here-proposed interdisciplinary practice-oriented approach of concepts.

Conceptual mapping

Before choosing the concept to work on, the team will explore the spectrum of related terms, connecting terms that may pertain to the description of the problems, goals or principles of action. As highlighted by the inferentialist theory of concepts, a concept may be explored by making explicit the set of inferences that underpin its use. Such an exploration is best achieved through a dialogue between collaborators, each asking the reasons of others. Obviously, these reasons will mobilize further concepts, gradually constituting a network of related knowledge around issues, goals, and

principles. This step is crucial to let team members become aware of their respective implicit inferences. Mind mapping tools can then be used to facilitate the visualization of the outputs of the discussion. The mind map will describe a space of interrelated concepts, each being a potential candidate on which the team can find its approach according to the goals and mindset of its members. For example, a team may start from the above-mentioned term of "resilience". A first conceptual exploration of their representations may lead the team to consider the related concepts of vulnerability, security, risk and crisis, prevention, preparedness and precaution, adaptation and mitigation, innovation and learning, capabilities, autonomy and interdependencies, resources and empowerment. By exploring the links between these concepts, the team will already have ample occasions to discuss and clarify much of their underlying assumptions when using the term "resilience". This will also most probably reveal discrepancies and contradictions between their thoughts, as well as fuzzy zones in their own thinking, hence a need to refer to work further on it.

Iterations between steps 1 and 2: navigating towards consensus and value-added

As evoked here above, the conceptual mapping step may lead to the identification of a related term that the team will deem more interesting and fruitful to analyze than the initial one. In all cases, the choice of a concept to animate discussions and group thinking is always to consider as subject to shifts or re-orientations. By discussing a first identified term of interest, the group may identify another term which they feel is more suitable to their goals or less prone to objections and blockades within the group due to interdisciplinary disagreements. Taking the above example of resilience further, some readings (Folke 2006; Gallopin 2006; Obrist et al. 2010; Quenault 2013; Thoren 2014) will let the team (maybe newly) realize the dimension of deep disturbance of the system or even disruption that it entails. Then, the team might find that their situation does not require this very concept and that "adaptation" or "coping" may be more adequate. As experienced in our master program, groups starting from the term "resilience" often choose finally to focus on derived qualities of the system supposed to be resilient, as organizational learning or resources, which present a significant width of interpretation and lend themselves more directly to practical implementation in the cases at stake.

A central concern throughout the iterative process of concept exploration and choice will be to identify the practical value-added of a given concept. In their principle-based conceptual analysis, Penrod and Hupcey (2005) pose a pragmatic principle that defends the importance of a concept to be practically applicable and useful. Obviously, this position is also defended in the present proposition. One should not speak about resilience where adaptation is "enough". This principle also points to a recurrent methodological step in exploring a concept (highlighted in Fig. 2). It indeed appears as a powerful heuristic in the critical approach of a concept to compare it to closely related ones. The initial mapping of relevant concepts will help in this regard, and be thus mobilized repeatedly by the team throughout its work. If one particular concept has to be adopted to guide the inter- or transdisciplinary action, it has to demonstrate a particular interest compared to other concepts. Let us take another example, about epidemiological surveillance facing emerging diseases. The term "surveillance" indeed shows a deep normative content with important societal consequences, as famously analyzed by Foucault (1993), but appears to be applied in a very technical way by epidemiologists, remaining mostly unaware of these philosophical ins and outs. Through discussions and readings, two related terms may emerge in particular, i.e., monitoring and vigilance. Those terms then refer in their turn to distinct considerations. Briefly stated, vigilance may rather point to ideas of prevention and foresight about negative events and to the social connections that allow for the desired reactivity (Fallon et al. 2012), while monitoring may better embrace altogether the follow-up of performances of the system, including but not limiting itself to disturbing events. According to the interdisciplinary composition of the team, it may be more inclined to explore one or the other of these three closely linked concepts of surveillance, vigilance and monitoring. In doing this, a team will be guided in finding the specificities of its action, better identifying and developing its unique perspective, its coherence and possible novelty (for example, by covering also the detection of opportunities and not only threats). By identifying the relations and differences between concepts within a semantic range, this step will indeed help identify how the proposed action relates to and differs from other actions in the same realm. This will shed light on the overall coherence of an action in a context involving multiple stakeholders and interventions.

Defining the concept: conditions of application and attributes

The objective of concept analysis is (a) to give a general and specific definition, (b) to specify the conditions and consequences of its application, that is to make explicit which inferences one is committed to when applying a concept. This analysis is not aimed at fixing once for all the "right" definition. The objective is rather to produce a working definition, fitting to the current needs of the team but being subject to later evolution. Indeed, the concept presents here a *colloquial* use, as opposed by Risjord (2009) to a *theoretical* usage of concepts, thus being an object of dialogue between different viewpoints rather than a fixed piece of knowledge.

The question of the conditions of application will lead the team to consider whether those are necessary and/or sufficient. Yet, there are few concepts that are defined by unequivocal necessary and sufficient conditions. Furthermore, it is often difficult to find, for any given concept, necessary conditions *or* sufficient conditions. A practical approach can be proposed on the basis of what has been developed in the context of nursing science (Branch and Rocchi 2015; Beecher et al. 2019; for examples of applications, see Wiseman 1996; Griffin-Heslin 2005; Xyrichis and Ream 2008).

For most concepts, we can proceed in two steps. A first step is to look at attributes that are *generally* or *commonly* associated with the concept. These common attributes can be sought through a literature review, by considering the most common and reflecting critically on their relevancy, i.e., their practical value-added to tackle an issue. One can also mobilize the interview of actors who make indeed use of the concept to analyze (professionals, partners, professors, and other stakeholders), asking them what they consider to be the essential attributes of it. A second step is to question more deeply the attributes of the concept. This can be done through case review: reflecting on cases (published, experienced or imagined) that one considers as being model/borderline/related/contrary case, asking oneself questions such as "what makes a case model and another one contrary?".

Primary and secondary concepts

In the next steps, the team will derive from their agreed understanding of a concept a congruent set of practical actions. This operationalization may be formulated by considering primary and secondary concepts. A primary concept is one from which the discussion starts and around which the approach will be organized. Secondary concepts are concepts appearing in the specific definition of the primary concept. Those might be also "thick" concepts and need further analysis to produce an explicit account of the team's shared understanding. As secondary concepts, their analysis will, however, not be as deep or open as that of the primary concept. Their definition will tend to restrict gradually the conceptual scope in order to end up with practical considerations. The process of operationalization will thus operate as a breakdown of a thick concept into unequivocal components, translating the subsequent choices of the team and the temporary agreement reached through its dialogue and confrontation of perspectives, understandings and values. For example, in order to propose an assessment of a scientific network, a team explores the concept of commitment. The commitment of network members appears to them as a promising track to inform a way forward for the network, being the primary concept they want to promote, hence to analyze and operationalize. Holding the role of primary concept, the term "commitment" is thus subject to extensive readings, discussions and actor consultations, in order to explore its polysemy and consequences of the different understandings possible: what does it mean in that case to be "committed"? From those investigations, the team came about to fix their understanding of the concept around four secondary concepts, that are involvement, motivation, participation and responsibility. Each of those concepts, although equally thick in turn and redirecting potentially to a rich literature, is here mobilized as "secondary" concepts, meaning that their analysis is aimed as more directed or restrictive, less dialectal or critical, focusing on the practical consequences they entail. This is thus leading us to the next step, in which each of these secondary concepts are operationalized into enquiry items (how to assess commitment in the network?) and levers for action (what can be done to improve that commitment?).

Enquiry items and levers for action

To establish an operation plan based on the chosen concept, the team has to identify two elements logically deriving from a chosen definition: enquiry items, to understand and assess a situation in the light of that concept, and levers for action, to improve that situation.

The term "enquiry items" is here aimed at covering widely the elements coming as answers to the question "what has to be looked at to understand and judge about a situation?". This step does not cover yet the question of the method that will be used for that assessment, although most often the identification of a metric will entail a restricted set of possible methods. This step will be highly influenced by the set of involved disciplines and stakeholders, their means and competencies. The identification of indicators within an inter- or transdisciplinary team is a rich step of exchange, further unraveling the peculiar viewpoints of each. In agreement with the general acceptation that is proposed here, a wide set of indicators must then be considered relevant by the team, covering quantitative or qualitative, causative or symptomatic, and direct or indirect indicators.

By their dual nature, both descriptive and prescriptive, thick concepts will not only lead the team to identify how the situation presents itself. It will also embody causal relations which will suggest elements on which actions can be taken to change the situation, i.e., levers for action. Starting from a concept, these causal relations will not be deployed along a tree of causes and consequences. Rather, those will be understood as a set of assumptions that underpin the team's choices. These assumptions will thus be made explicit in a step asking "what can be done?" (Ansell and Geyer 2017), identifying levers that are logically bound to the chosen definition. Resuming the above example of commitment, let us focus on one of the secondary concepts, i.e., participation, and derive examples of practical implementation elements.

Handling it as a secondary concept, the team may agree on a restrictive understanding of participation that will be the act of holding a share in the decision-making (in the network initiatives). Hence, it will be possible to gauge the participation in the network by assessing the number and types of decisions that members are contributing to, as well as the weight held by their contribution, from the mere sharing of an opinion to the voting right or even veto power. The implementation of polls or voting tools in the network will be a lever to improve participation, hence commitment, in the network. Coming back to the classical example of resilience, we may note that its wide use has obviously been translated into very operational ways by several authors, who then provide good examples of what would be expected from a process of "operationalization" as proposed here (Wardekker et al. 2010; Darnhofer 2014; de Bruijn et al. 2017; Massaro et al. 2018).

Finally, we argue that, by following this thread of dialectal, documented and explicit choices in the disentanglement of a chosen thick concept, this analysis will help the team avoid the pitfall of mundane, abstract or standard recommendations, valid regardless of the particular situation or perspective taken on the issue (e.g., the network should generate a better commitment from its members and adopt a more participatory management). In disciplinary actions, this process may be fulfilled but mostly kept tacit, actions being anchored in founding concepts of the disciplines and defined by the state-of-art and good practices of that discipline. Interdisciplinary teams will need to shed light on the process and follow its steps consciously to produce new approaches integrating the perspective of each contributor. A renewed and negotiated conceptual framework will allow the team to justify clearly the coherence between their understanding and their action.

Conclusion

Finally, this paper outlines the use of concepts to guide action facing complex issues, in inter- and transdisciplinary endeavors. Far from holding us in purely discursive spheres, working with rigor on concepts is here proposed as a way to keep our minds focused on practical consequences and value-added of the guiding words that are populating projects, policies and research. Unraveling the width of interpretations, the diversity of assumptions and values behind these words is a very first and needed step to build a collective action. Naturally, this proposal is not aimed as a finalized and closed method. Rather, we hope that this will invite more scientists and practitioners to enter into this reflection and structure gradually a rigorous, though rich and creative, use of concepts to underpin their inter- and transdisciplinary endeavors needed to study and promote sustainability. We firmly believe that conceptual analysis should become a widespread practice among scientists and practitioners, to serve as a facilitating approach to collective action for sustainability. To reach that goal, this practice has to be informed and improved through the exchange of experience of all who implement it. We hope to spur here such needed exchanges.

References

Andreotti F, Speelman EN, Van den Meersche K, Allinne C (2020) Combining participatory games and backcasting to support collective scenario evaluation: an action research approach for sustainable agroforestry landscape management. Sustain Sci 15:1383–1399. https://doi.org/10.1007/s11625-020-00829-3

Ansell C, Geyer R (2017) 'Pragmatic complexity' a new foundation for moving beyond 'evidence-based policy making'? Policy Stud 38(2):149–167. https://doi.org/10.1080/01442872.2016.1219033

Antoine-Moussiaux N (2018) The bridging role of socio-economic reasoning in one health. Bull Séanc Acad R Sci Outre-Mer 64(1):39–60. https://doi.org/10.5281/zenodo.3980725

Antoine-Moussiaux N, Janssens de Bisthoven L, Leyens S, Assmuth T, Keune H, Hugé J, Zinsstag J, Vanhove MPM (2019) The good, the bad and the ugly: framing debates on nature in a one health community. Sustain Sci 14(6):1729–1738. https://doi.org/10.1007/s11625-019-00674-z

Apetrei CI, Caniglia G, von Wehrden H, Lang DJ (2021) Just another buzzword? A systematic literature review of knowledge-related concepts in sustainability science. Glob Environ Chang 68:102222. https://doi.org/10.1016/j.gloenvcha.2021.102222

Baccini P, Oswald F (2008) Designing the urban: linking physiology and morphology. In: Hirsch Hadorn G, Hoffmann-Riem H, Biber-Klemm S, Grossenbacher-Mansuy W, Joye D, Pohl C, Wiesmann U, Zemp E (eds) Handbook of transdisciplinary research. Springer, Dordrecht, pp 79–88

Bal M (2020) Travelling concepts in the humanities: a rough guide. University of Toronto Press, Toronto

Beecher C, Devane D, White M, Greene R, Dowling M (2019) Concept development in nursing and midwifery: an overview of methodological approaches. Int J Nurs Pract 25:e12702. https://doi.org/10.1111/ijn.12702

Branch J, Rocchi F (2015) Concept development: a primer. Philos Manage 14:111–133. https://doi.org/10.1007/s40926-015-0011-9

Brandom R (1994) Making it explicit. Harvard University Press, Cambridge

Brandom R (2000) Articulating reasons: an introduction to inferentialism. Harvard University Press, Cambridge

Cilliers P, Biggs HC, Blignaut S, Choles AG, Hofmeyr JS, Jewitt GPW, Roux DJ (2013) Complexity, modeling, and natural resource management. Ecol Soc 18:3. https://doi.org/10.5751/ES-05382-180301

Darbellay F (2012) The circulation of knowledge as an interdisciplinary process: travelling concepts, analogies and metaphors. Issues Integr Stud 30:1–18

Darnhofer I (2014) Resilience and why it matters for farm management. Eur Rev Agric Econ 41(3):461–484. https://doi.org/10.1093/erae/jbu012

de Bruijn K, Buurman J, Mens M, Dahm R, Klijn F (2017) Resilience in practice: five principles to enable societies to cope with extreme weather events. Environ Sci Policy 70:21–30. https://doi.org/10.1016/j.envsci.2017.02.001

Fallon C, Piet G, Thiry E, Dal Pozzo F, Zwetkoff C (2012) Renouveler la gestion du risque par l'ouverture à un système de vigilance? Le cas de la fièvre catarrhale ovine. Vertigo. https://doi.org/10.4000/vertigo.13153

Folke C (2006) Resilience: the emergence of a perspective for social–ecological systems analyses. Glob Environ Change 16(3):253–267. https://doi.org/10.1016/j.gloenvcha.2006.04.002

Foucault M (1993) Surveiller et punir. Gallimard, Paris, p 388

Gallopin GC (2006) Linkages between vulnerability, resilience, and adaptive capacity. Glob Environ Change 16:293–303. https://doi.org/10.1016/j.gloenvcha.2006.02.004

Griffin-Heslin VL (2005) An analysis of the concept dignity. Accid Emerg Nurs 13:251–257. https://doi.org/10.1016/j.aaen.2005.09.003

Jacobs M (1999) Sustainable development as a contested concept. In: Dobson A (ed) Fairness and futurity. University Press, Oxford, pp 21–45

Jahn T, Bergmann M, Keil F (2012) Transdisciplinarity: between mainstreaming and marginalization. Ecol Econ 79:1–10. https://doi.org/10.1016/j.ecolecon.2012.04.017

Kates RW (2011) What kind of a science is sustainability science? Proc Natl Acad Sci 108(49):19449–19450. https://doi.org/10.1073/pnas.1116097108

Leyens S (2014) Towards a transcultural definition of prosperity. Insights from the capability approach. In: Cassiers I (ed) Redifining prosperity. Routledge, London, pp 41–56

Maher R, Maher M, McAlpine CA, Mann S, Seabrook L (2018) Overcoming barriers to sustainability by combining conceptual, visual, and networking systems. Sustain Sci 13:1357–1373. https://doi.org/10.1007/s11625-018-0576-z

Massaro E, Ganin A, Perra N, Linkov I, Vespignani A (2018) Resilience management during large-scale epidemic outbreaks. Sci Rep 8:1859. https://doi.org/10.1038/s41598-018-19706-2

Nagatsu M, Davis T, DesRoches CT, Koskinen I, MacLeod M, Stojanovic M, Thorén H (2020) Philosophy of science for sustainability science. Sustain Sci 15:1807–1817. https://doi.org/10.1007/s11625-020-00832-8

Obrist B, Pfeiffer C, Henley R (2010) Multi-layered social resilience: a new approach in mitigation research. Prog Dev Stud 10(4):283–293. https://doi.org/10.1177/146499340901000402

Penrod J, Hupcey JE (2005) Enhancing methodological clarity: principle-based concept analysis. J Adv Nurs 50(4):403–409. https://doi.org/10.1111/j.1365-2648.2005.03405.x

Pohl C, Hirsch Hadorn G (2008) Methodological challenges of transdisciplinary research. Nat Sci Soc 16(2):111–121. https://doi.org/10.1051/nss:2008035

Quenault B (2013) Retour critique sur la mobilisation du concept de résilience en lien avec l'adaptation des systèmes urbains au changement climatique. Echo Géo. https://doi.org/10.4000/echogeo.13403

Rawls J (1971) A theory of justice. Belknap Press, Cambridge

Risjord M (2009) Rethinking concept analysis. J Adv Nurs 65(3):684–691. https://doi.org/10.1111/j.1365-2648.2008.04903.x

Rossini M (2020) Nomadic concepts. td-net toolbox profile (13). Swiss Academies of Arts and Sciences: td-net toolbox for co-producing knowledge. 10.5281/zenodo.3717144

Sellars W (1963) Science perception and reality. Routledge and Kegan Paul, London

Sidikou DI, Irabor TJ, Bonfoh B, Binot A, Faulx D, Vandenberg O, Leyens S, Antoine-Moussiaux N (2022) Teaching and learning for change: analysis of a post-graduate one health program. Sustain Sci 17:65–80. https://doi.org/10.1007/s11625-021-01053-3

Snowden DJ, Boone ME (2007) A leader's framework for decision making. Harv Bus Rev 85(11):68–76

Stengers I (1987) D'une science à l'autre, des concepts nomades. Seuil, Paris

Thoren H (2014) Resilience as a unifying concept. Int Stud Philos Sci 28(3):303–324. https://doi.org/10.1080/02698595.2014.953343

Wardekker JA, de Jong A, Knoop JM, van der Sluijs JP (2010) Operationalising a resilience approach to adapting an urban delta to uncertain climate changes. Technol Forecast Soc Change 77:987–998. https://doi.org/10.1016/j.techfore.2009.11.005

Wear D (1999) Challenges to interdisciplinary discourse. Ecosystems 2:299–301. https://doi.org/10.1007/s100219900080

Williams B (1985) Ethics and the limits of philosophy. Harvard University Press, Cambridge

Wiseman T (1996) A concept analysis of empathy. J Adv Nurs 23:1162–1167. https://doi.org/10.1046/j.1365-2648.1996.12213.x

Wittgenstein L (1953) Philosophical investigations. Basil Blackwell, Oxford

Xyrichis A, Ream E (2008) Teamwork: a concept analysis. J Adv Nurs 61(2):232–241. https://doi.org/10.1111/j.1365-2648.2007.04496.x

Zinsstag J, Waltner-Toews D, Tanner M (2015) Theoretical issues of one health. In: Zinsstag J, Schelling E, Waltner-Toews D, Whittaker M, Tanner M (eds) One health: the theory and practice of integrated health approaches. CAB International, Oxfordshire, pp 16–25