Sensemaking and social research in the analysis of educational processes: some methodological problems

Giovanni Bertin[1]

Abstract: In social research, the phase dedicated to concept definition constitutes the all-important contact point between the theoretical basis of the work and the data collection. This phase is more complicated when there is no common agreement between researchers regarding the meaning of a concept and when they use different (in part or completely) semantic structures. This article will take a closer look at the methodological problems underlying the comparison of the cognitive structures of different actors when the concepts are not predefined on the basis of a debate occurring within the scientific community, but are instead the product of a shared-sensemaking process.

Keywords: Sense making, Consensus method, Concept mapping.

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[1] Department of Economics, University Ca' Foscari, Venice, Italy. E-mail: giovanni.bertin@unive.it

Introduction

In social research, the phase dedicated to concept definition constitutes the all-important contact point between the theoretical basis of the work and the data collection. The concepts are defined by analysing the debate held between experts in a certain field of research and by recognising the 'meanings' that are unanimously agreed upon or 'shared' by the scientific community. Concept specification is required in order to allow the research to identify the empirical evidence (the observable elements) upon which to concentrate data collection. This process, which would seem to be straight forward, can however become more complicated when there is no common agreement between researchers regarding the meaning of a concept and when they use different (in part or completely) semantic structures or when the theoretical basis of an area of study has not yet produced unanimously shared knowledge. The problem is typical, for example, of second order research that is based on the knowledge of experts coming from different disciplines, but who are called to use the same concepts. In such cases, we can see that the valuations are influenced by the theoretical background of reference due to the different perspectives from which the researchers develop their observations. Another typical context that poses this problem in particular is that of policy analysis. In this case, the risk regards the use of evaluation criteria. In the evaluation processes, the criteria perform the task that in social research is usually performed by concepts, and they form the basis for defining the information to be collected and the formulation of the judgement of the subject under evaluation (programme, process, etc.). The element of greatest complexity regards the values that underlies the definition of the criteria and that makes the comparison and the construction of the judgement even more complex when numerous actors are called to make the evaluation togeth. This perspective is important for all studies related to decision making (the planning as well as the evaluation phases). In this case, the definition of the concepts (or of the criteria in the evaluation) is not only linked to theory, but it is an expression of the debate being held in the different 'languages' and cognitive structures of the actors. Such a comparison never has a component that is purely cognitive, but it is also conditioned by relational dynamics, power and by individual strategies. The debate established often ends up being based on the search for mediation, and is conditioned by the dynamics of

power that connect the social actors. The achievement of a shared view, achieved through mediation of the various perspectives, is not the result of a thoughtful process of meaning construction (*i.e.* sensemaking) and therefore the risk linked to the presence of different cognitive structures that condition the analysis and the decisions made by the individual social actors continues to be present. This risk strengthens the centrality and the specificity of the definition of the concepts, but also highlights that their definition by means of theoretical debate is not always possible. It is often necessary to start from the reconstruction of the cognitive structures used by the social actors that contribute to the production of knowledge and to the development of decision-making processes. From this perspective, the conceptual phase assumes the characteristics of a discussion about the various languages and constitutes a sensemaking process.

This article will take a closer look at the methodological problems underlying the comparison of the cognitive structures of different actors when the concepts are not predefined on the basis of a debate occurring within the scientific community, but are instead the product of a shared-sensemaking process. In light of these considerations, I will also try to reveal how in the field of the analysis of educational processes, research designs are being developed that start with the reconstruction of cognitive maps and with the activation of sensemaking processes.

Meaning, shared-meaning and communicative competence

The concept of meaning is central to sociological research. Indeed, Parsons, back in the 1930s, already identified meaning as forming a fundamental element in his theory of social action, even though its use in his systems theory on the hierarchy of control mechanisms received considerable criticism. The concept started to be used by authors that assumed different theoretical perspectives and it opened up an interesting debate. It is valuable to recall the comment made by Habermas (1971, p. 115), where he sustained that: "Luhmann and I are both of the opinion that meaning should be introduced as one of the fundamental concepts of sociology, if not the most fundamental concept, because the emerging property of the reality mediated by meaning, required for socio-cultural development, activates, under at least three aspects, a theoretical programme that is appropriate to

this objective field: in relation to the transformation of experience into data; regarding the construction of theories; and when considering the relationship between theory and experience". In this view, Habermas makes the concept of meaning a fundamental element in the process of knowledge construction and he considers it to be a turning point that opens up the way to the re-elaboration of data obtained from the rereview of experiences and the systemisation of data within a precise theoretical framework. The emphasis is placed on the processes of communication, considered to form the core of the connections between action and the construction of knowledge. Luhmann (1988, p. 18) sustains that the concept of meaning "indicates the ordered form of the living experiencing human and not just any state of things in the world, sectorially determined. Thus, a phenomenal description of that that is actually given in the living experience of meaning allows direct access, free of presumptions, to the problem of meaning". Luhmann's view of concept places emphasis on the reflective dimension of action and on the dynamics of interaction that occur between the social actors and the system. These two views, although possessing many elements of concordance, allow us to place attention on the semantic dynamics included in the concept of meaning, that is to say the nature of the meaning that permits communication between the actors involved, and the basic structure of the actions of individuals and of the system. These dimensions were highlighted by Ardigò (1980, p. 48), for whom "meaning is the intentionality (thus selectivity) of the living experience (*i.e.*, seeing, feeling and living together with others) in taking action. Meaning is signification. Words, gestures, signs, sounds and actions have no meaning if they do not have, when taken together or individually, meaning for man-kind and for communication between men, or for the culture of the collective". Thus, meaning is a guide to action because it allows people to identify what they require for their own needs and to direct their actions, but it is also the element that allows meaning to be given to information produced by experience and from communication with others (in the inter-personal dimension) and with the system (in the societal dimension).

In the signification dimension, meaning makes communication possible and leads to the construction of semantic structures that allow experiences and realities to be interpreted. Researchers, confirming the reflective and autopoietic processes underlying sensemaking, emphasise its unstable and

evolving nature. This process has two important implications. On the one hand, it is useful to remember that evolution is accompanied by diversification and that communication leads to a discussion that develops on two levels and which need to be specified as the exchange of information and sensemaking, where the meaning is relatively independent of the information. For Habermas, the informative character of information varies in relation to the information already acquired by the actors and by the semantic structures used to make sense of the information. The content of meaning does not vary, however, depending on the information produced. This affirmation arises from considering the concepts and their semantic structures to be unchanging with time, as if they were two independent entities, the first linked to sensemaking and the second, as a consequence of the first, to information exchange. But circular dynamics exist between these two processes that complicate communication. Moreover, Berger and Luckmann (1966) remind us that not only does common sense lead to different "pre and semi scientific" interpretations, but that these structures end up influencing the process of redefining the semantic structures used to interpret information. Indeed, reflectivity and communication allow social actors to reprocess experiences and develop cognitive structures. Meanings pre-exist and make sense of information, but communication is relational and the actors also look to confirm the semantic codes used to exchange information. This process allows communication to develop and reduces the inherent complexity in the differentiation of cognitive structures. Furthermore, while the dynamic nature of concepts forms part of scientific research, it also characterises inter-subject and systemic communication processes. The relationship between meaning and shared-meaning, in the context of signification, can therefore be represented by the dynamics of comparison between the semantic structures of the individual actors. In other words, we can affirm that shared-meaning is the process of reducing the inherent complexity in the diversification of cognitive structures and of the effort to built meaning structures that are shared by the actors. In this perspective, the dynamics that characterise the communication processes that guide sensemaking are of central importance. The social importance of communication processes has become the topic of much research and theoretical reflection in sociological debate. Research has highlighted different interpretative perspectives of the communication process, which place importance on its

strategic nature, which results in the exchange of information being conditioned by the strategic goal pursued by the actors, or on its characteristics of symbolic exchange, in which the ritual of communication has a function of consolidating social rules and the roles. From this point of view, with regard to the processes underlying sensemaking, communication constitutes the process through which debate should be evolved in order to create meaning, exchange information and re-interpret experiences in a reflective manner. An important contribution to the understanding of these processes comes from the theory of communicative competence formalized by Habermas (1981) with his work on the theory of communicative action. The author analysed the processes that explain the dynamics of communication and bring into focus the conditions that permit communication and allow meaning to be assigned to the information exchanged. In the communicative action perspective, reality cannot be separated to a significant degree from what we consider to be true in light of pre-existing knowledge. Habermas retains (1981, p. 83) "I can, then and only then, attribute a predicate to a subject, when any other person, that may be in conversation with me, attributes the same predicate to the same subject.... The truth condition of propositions is the potential assent of all others truth". Thus, the sharing of meanings constitutes the starting point for considering a predicate as true. In this sense, Habermas is talking about the consensual theory of truth, certainly not ascribable to a process of negotiation between actors, because the limit is placed in the counterfactual dimension that permits the verification of the truth of the affirmations forming the basis of the communication. Moreover, this verification is deemed to be necessary when the actors present truths that are not shared and, contemporarily, when the communication is taking place between experts. The truth rests, therefore, on the sharing of predicates by experts and on the potential to make the rules of predicate construction clear (also of the counterfactual kind). A final clarification that is important for our reflections regards the definition of the conditions that allow us to define an expert. These conditions regard the individual, but also the context in which the communication is made. Indeed, not only must the individual possess knowledge, but they must also adopt a rational behaviour in communication. In this context, the term rational refers to a behaviour that abides by correct actions, *i.e.* which bases the construction of an individual's truth on the verification of empirical observations and not on

tradition or emotional perceptions. The context's conditions must permit communication that does not produce constraints and this situation is created when for "all possible participants, there is a symmetrical distribution of chances to choose and to apply speech acts" (Habermas, 1971, p. 91).

The construction of knowledge based on the exchange of information is based, therefore, on the process of communication, through which free and unconditioned subjects discuss their truths and their constructions of meaning, reporting in the discussion their own knowledge and the empirical evidence upon which their knowledge is built. This process is put into effect when, and only when, all actors adopt the right behaviour, i.e. when they follow rational logic and recognise others as bearers of evidence also worthy of consideration.

Sensemaking and analysis of educational processes: a review of the literature

A review of the literature regarding educational processes indicates that the research techniques coherent with sensemaking logic have been used for different goals and have followed different approaches. One application regards supporting educational processes, realised through the reconstruction of cognitive maps (Nesbit, *et al.*, 2006; Schaal, 2010; Stewart, 2012). This perspective is interesting from the pedagogical point of view because it develops learning processes starting with the knowledge that the students already possess and their personal organisation of knowledge. Once again, we can speak of sensemaking considering that the educational intervention (*i.e.* lesson) constitutes the "environmental stimulus" (Weick, 1995) from which each student will be called to compare and reprocess their cognitive maps. The work of explaining their cognitive maps constitutes a stimulus that allows individuals to reprocess and restructure their own knowledge, giving meaning to the information required. However, this perspective is not usually found within methodological discussions of social research. Although educational processes do not have research goals, they can constitute an interesting stimulus for studies that are being developed within the action research approach.

Constricting the analysis to studies that come under the heading of social research and that refer to the study of the semantic structure of a determined population involved in educational processes, a possible classification of the studies emerges in relation to: the overall research goal; and to perspectives from which concept maps are considered. Using these two dimensions, it is possible to reclassify the studies according to the following six types (table 1):

 i) Studies that have analysed the social phenomena from the point of view of the cognitive structures of the individual people belonging to a precise target group. The hypothesis underlying these studies is attributed to a cognitive approach, according to which the reconstruction of the important structures used by a determined population, in relation to a phenomenon being studied, provides useful elements (although not exclusive) for interpreting social behaviours (see, for example, Bayer, *et al*., 2005);
These studies involve the reconstruction of the individual cognitive maps of the subjects analysed, and they adopt an approach that can be ascribed to concept mapping (Trochim and Kane, 2005; Trochim and Cabrera, 2005);

 ii) Studies that analyse social phenomena from the point of view of the cognitive structures of the target group and that activate a sensemaking process in the group. The activation of a sensemaking process leads to the development of discussions between the subjects involved in the study and the creation of conditions that encourage the participants to re-evaluate their own competences. This form of research uses techniques that can be attributed to the approach defined as the consensus method (Bertin, 2011). No important examples of this type of theoretical study exist in the literature, even though theoretical studies have advised that such a strategy should be followed in studies involving youngsters (MacPhail, 2001). Furthermore, techniques that activate sensemaking processes are advisable when the subjects involved are considered to be experts of the problem being analysed and when a debate between such experts is thought to allow potentially distorting factors to emerge;

 iii) Studies that aim to support the processes of planning interventions or policies (in our case educational interventions) and that consider it important to create decision-making processes starting with the reconstruction of the cognitive maps of the target population or the stakeholders involved (Hinck, *et al*., 2006; Cook, *et al*., 2012). In this case,

research constitutes a starting element from which to activate a debate between the decision makers. The logic followed aims to represent the cognitive maps of the group, without activating a process of sensemaking, and to fix (even if in a static way) the choices regarding the expectations and the interests of the recipients of the interventions or the stakeholders. From this methodological point of view, the decision to make an overview of the semantic structures used by the subjects analysed leads to the use of a research approach that can be attributed to the logic of concept mapping (Kane and Trochim, 2007);

iv)   Studies that aim to support the decision making or policy planning (in our case educational interventions) that follow participative logic and consider it of central importance to support a debate between the actors of the system, thereby developing processes of sensemaking (Moss, *et al.,* 2009; Kiessling, *et al.*, 2009; Chipchase, *et al.*, 2012). In this case, negotiation between the actors is not contractual but it moves the debate to the characteristics of the cognitive maps of the social actors in order to elucidate: the areas of homogeneity; which factors should be the subject of discussions in order to help reduce informative distortions and clarify the elements of conflict determined by various concerns, values and interests. Once again, the choice to develop a sensemaking process and to create tight connections (Weich, 1997), built on the sharing of the decisions, leads researchers to use research techniques that can be attributed to the logic of the consensus method;

v)   Studies that evaluate the learning processes used as a verification of the changes in cognitive structures produced by specific educational interventions (Chiu, Huang and Chang, 1999; Schaal, Bogner and Girwidz, 2009), or that evaluate the thought processes of organised learning (Sutherland and Katz, 2005) or, finally, that evaluate the satisfaction of the target group regarding specific educational interventions (Buldua and Buldub, 2010). The studies categorised into this group have used changes in the individual cognitive maps as indicators of the effect produced by a specific educational intervention;

Table 1. Some examples of studies in the field of the analysis of educational processes

	Reconstruction of individual cognitive maps	*Activation of sensemaking*
Research goal: analysis	- Adolescents can know best: Using concept mapping to identify factors and pathways driving adolescent sexuality in Lima, Peru (Bayer, Cabrera, Gilman, Hindin & Tsui, 2005)	
Research goal: to support planning	- Student learning with concept mapping of care plans in community-based education (Hinck, Webb, Sims-Giddens, Helton, Hope, Utley, Savinske, Fahey & Yarbrough, 2006) - From care plan to concept map: A paradigm shift (Cook, Dover, Dickson & Colton, 2012)	- The Fount of All Knowledge: Training Required to Involve Service Users and Carers in Health and Social Care Education and Training (Moss, Boath, Buckley & Colgan, 2009) -Communication and social competencies in medical education in German-speaking countries: The Basel Consensus Statement. Results of a Delphi Survey (Kiessling, *et al.*, 2009) - Characteristics of student preparedness for clinical learning: clinical educator perspectives using the Delphi approach (Chipchase, Buttrum, Dunwoodie, Hill, Mandrusiak & Moran, 2012)
Research goal: evaluation	- The evaluation and influence of interaction in network supported collaborative concept mapping (Chiu, Huang & Chang, 1999) - Concept mapping methodology: a catalyst for organizational learning (Sutherland & Kat, 2005) - The use of concept maps to evaluate critical thinking in the clinical setting (Senita, 2008) - Critical reflection in a TESL course: mapping conceptual change (Farrell, 2009) - Concept Mapping Assessment of Media Assisted Learning in Interdisciplinary Science Education (Schaal, Bogner & Girwidz, 2009) - Concept mapping as a formative assessment in college classrooms: measuring usefulness and student satisfaction (Buldua & Buldub, 2010)	- The use of the nominal group technique as an evaluative tool in medical undergraduate education (Lloyd-Jones, Fowell & Bligh, 1999) - Patient-centred medicine through student-centred teaching: a student perspective on the key impacts of community based learning in undergraduate medical education (Howe, 2001) - A Delphi study to update CTE teacher competencies (Manley & Zinser, 2012) - An empirical investigation of entrepreneurship intensity in Iranian State Universities (Mazdeh, Razavi, Hesamamiri, Zahedi & Elahi, 2012)

vi) Studies that activate sensemaking processes in order to get stakeholders (within or external to specific organisations) and users involved with the evaluation of specific social projects. Such studies have followed two different lines of research in particular. One of these two approaches assigns to the sensemaking processes the task of defining a set of homogeneous and shared evaluation criteria, within mixed study designs that use differentiated and integrated research techniques (Mazdeh, *et al*., 2012). A second approach uses research techniques attributable to the consensus method to produce directly an evaluation that represents all the social actors (Lloyd-Jones, *et al.,* 1999; Howe, 2001; Manley and Zinser, 2012).

An (integrated) approach and two research strategies

A review of the studies presented in the previous section enables us to highlight how an analysis of the semantic dimensions of the phenomena analysed and the cognitive maps of the actors involved has been tackled whilst addressing different objectives and using different research techniques. It is also possible to note how these approaches are often developed within integrated research strategies (mixed method) that use both qualitative and quantitative logic. This observation reveals us how such research strategies can become complex, highly structured and integrated. Thus placing emphasis on individual maps or on the opportunity to activate sensemaking strategies that produce shared cognitive maps poses various methodological problems, requiring the application of different (although integratable) research strategies. From this standpoint, it is useful to consider in more depth the methodological problems implicated in the construction of the individual cognitive maps and, to this end, focus attention on the best approach to concept mapping (Trochim and Kane, 2007) and on the problems underlying the sensemaking processes that can be attributed to techniques that are traditionally classified within the consensus method approach (Bertin, 2011).

Concept mapping and the reconstruction of individual cognitive maps
Around the mid 1970s, concept mapping started to be recognised as a research technique that could be used to interpret and give meaning to the

data emerging from clinical interviews in a variety of contexts, such as: education, psychology and sociology. The reason why the opportunity to analyse the qualitative material emerging from such interviews in depth started to be considered was due to the possibility of summarising the data by reconstructing the cognitive structures used by the interviewees. The theoretical basis upon which such experiments were based refers back to two theories that were developed in the cognitive field towards the end of the 1960s. Ausubel (1968) talks about Assimilation Theory representing, in a hierarchical manner, the process of memorisation and classification of concepts. In other words, if "we already know the concepts of dog, bird and cat, when we encounter the concept animal, we give it a hierarchical level above the others already present" (Croasdell, Freeman and Urbaczewsky, 2003, p. 397). Some years earlier, Deese (1965) talked about Associationist Theory, sustaining that the memory of each individual consists of a network of concepts that is naturally formed. Each subject links two concepts when they believe that overlaps exist between one or more dimensions that characterise the concept used. These links make up a network or concept map. Furthermore, the reflections made by (1995) on the cognitive processes underlying sensemaking also talk about cognitive maps that guide the processes of information selection, reality representation and the support of decision-making processes. The contribution of Weich then proposes to consider that concept maps tend to be instable and evolve in relation to external environmental stimuli. An individual has, in their everyday life, different experiences and receives different stimuli that, consequently, tend to differentiate the concept maps. This process leads us to consider that is impossible to identify a concept map that is better than the others, and to which all must adapt. It is preferable to speak about evolving and differentiating processes. Evolution and differentiation tend to render the processes of communication complex because they change the codes that permit the transfer of messages. This situation requires (and, moreover, it is a typical process in all complex organisations) the intensification of comparison processes and the construction of shared concept maps, or at least explicit maps able to support communication. The centrality of the concepts (involved in the communication and construction processes of knowledge) poses the problem of their clear definition. According to Lazarsfeld "a concept is simply an entity conceived in vague terms, which give meaning to the

relationships observed between phenomena and from which measurements can start to be built upon" (Lazarsfeld, 1965). The complex nature of concepts is well outlined by Marradi who highlights how they must be considered open and in continual evolution. Indeed, Marradi sustains that "The individual remixes and reactivates the concept constructs that he has received, trying to resolve the problems that he is faced with" (Marradi, 2007). This affirmation takes us to imagine that the process of defining concepts is a continual process, produced by the reprocessing of experiences and from the construction of a concept system useful for understanding problems that we encounter. On the other hand, the clarification of the concepts is passed through an analysis of the intention (intensione) and the extension of the concept (Marradi, 2007). Concepts also perform a function of reducing the ambiguity of communication. Bernardi (Bernardi, 2005) sustains that "a concept is not true or false, it is simply a temporary inter-subjective convention that is heard/discussed by the scientific community". These observations lead us to consider the process of concept specification as being central in all types of research study, whether they be quantitative (in this case the identification of indicators is fundamental) or qualitative (to guide the observation of reality), and usually the work of defining the concepts is by performed by the researcher (Bernardi, 2005).

In the case of research orientated at the reconstruction of cognitive structures or at the activation of construction processes of shared meanings, the concepts and the network that connects them are not predefined, but constitute themselves the subject of study. In other words, the concepts are reconstructed starting with the associations that the individuals use to connect them for communication. A consequence of this situation is that the communication material on which to work presents different levels of abstraction and often assumes the character of the element that is directly observed.

An important contribution to this methodological debate has been provided by Trochim (Trochim and Cabrera, 2005; Trochim and Kane, 2005; Kane and Trochim, 2007). In his studies, Trochim explicitly talks about a research method called Concept mapping. According to Trochim, this entails a structured process of conceptualisation (providing concepts with evidence and structure) that can be used by a group to develop a cognitive framework (a concept space) that is also useful for the development of

planning and evaluation activities. The first phase of a planning process, as for evaluation activities, is the most complex and requires the clear and shared clarification of the concepts used. Noval (2010) proposes that a logical strategy is followed, based on the capacity to work on the concepts and on their hierarchical relationships, starting with the knowledge already consolidated by the individual who is called to construct a new map. The approach followed is based on visual logic that is used to design a map of the links that connect the different concepts used. The methodology proposed by Trochim and Kane (2005) is more complex, but also more rigorous. These authors talk about methodologies of structured conceptualisation that are based on "a mixed methods participatory group idea mapping methodology that integrates well-known group processes such as brainstorming and unstructured sorting with the multivariate statistical methods of multidimensional scaling and hierarchical cluster analysis" (Trochim and Kane, 2005, p. 187). This arrangement is designed for analysing the cognitive structures of a group. The logic adopted by the authors represents the cognitive maps of the individual actors and the group dimension is seen as a group of individual maps, presenting determined characteristics. Multivariate analysis is used to construct a type of map used by the actors and, subsequently, to classify the individuals on the basis of the cognitive maps used. Less attention is placed on the discussion between the actors and on the process of sensemaking.

Consensus method: from maps to shared meanings
Techniques that use consensus between actors as an element for verifying the trustworthiness of the work date back to the 1960s, but only in the 1990s were such techniques revisited. The incentive to redefine such techniques, or at least to formalise a robust approach to the use of methodologies based on consensus, comes from: the diffusion of research interventions as a professional practice; an increase in the attention paid to participative processes of evaluation in the work place; the diffusion of processes for the construction of guidelines within the "tough" professions with well established knowledge and that use specific procedures to "self-regulate" professional practices. A critical evaluation of the research has allowed positive aspects and critical elements of the individual techniques to be highlighted and has activated a debate on the possibility of using the consensus method as an approach that is specific to social research. Today,

it refers to a research method that takes its shape and uses different techniques in function of the goals of the study, but which is based on a defined process organised into two basic phases: the construction of shared meaning (agreement about meanings) and the verification of consensus (the presence of homogeneity in the representations or in the evaluations).

The construction of shared meaning.
This phase is dedicated to i) the reconstruction and sharing of the cognitive maps that we use in the process of communication and ii) the comparison of the maps. The result of this phase is the reconstruction of the concept structures formed by the individual actors involved, which are evolved and re-elaborated in a shared manner.
The construction of shared meaning is activated by investigating the cognitive structures, and it should be developed with an emphasis directed at the exhaustiveness of the analysis. This requires the use of different techniques (table 2) that can favour the assessment of the various observable concepts or elements used to represent the phenomenon analysed. To avoid the consolidation of cultural stereotypes, it is useful to refer to the current debate in the literature and investigate whether such stereotypes can, in fact, suggest elements of analysis to integrate with those emerging from the work done with the participating subjects. It is important that these aspects only constitute opportunities to identify stimuli that can contribute to the sensemaking process.

Table 2. The research techniques used in the assessment phase of cognitive structure

Research process	Technique	When to use them
Assessment of participants' cognitive maps	Brainstorming	- when a problem is clear and important; attention is directed at identification of items that describe the cognitive maps of experts
	Focus group	- when it is important to reveal the different points of view and investigate further the potential differences
	Other non standard techniques	- when there is great need to investigate a certain theme in greater depth
Survey of the concepts present in the literature		- analysis of the scientific literature, reconstruction of the concepts used and of the meanings of their attributes

The pressure to execute an exhaustive study leads us to consider various research techniques in an integrated manner. The informative objectives to pursue, the characteristics of the experts and their cultural and professional backgrounds, the resources and the topics available will suggest which techniques would be most suitable for performing this phase of the research.

Verification of consensus.

This phase is dedicated to the collection of data (estimates, forecasts, evaluations) and to the verification of their trustworthiness, and it is based on the analysis of the homogeneity of the group involved in the research study. The literature suggests the use of research techniques that can be considered as being interchangeable, which are chosen in relation to the characteristics of the informative problem faced, and the subjects that must be involved. The most cited techniques in the literature, in relation to the analysis of educational processes, are NGT and Delphi. These techniques refer to a homogeneous reference paradigm, attributable to classic pragmatism and that takes the homogeneity of the opinions collected as an indicator of the trustworthiness of the data collected. Moreover, the NGT and Delphi techniques specify the process to follow in order to avoid consensus being a product of "powerful" relationships and relational dynamics that may connect the subjects involved, which would constitute a distorting factor.

Although the NGT and Delphi techniques are performed differently, both follow a similar research strategy, which follows three fundamental phases:

- data collection, relative to the social representation of the individual actors or their evaluations of the phenomena studied. This phase is performed by collecting the data in an individual manner, without any discussions taking place between the subjects involved;
- the elaboration of the data and their analysis. The data collected are reprocessed to investigate their homogeneity and to stimulate (in a different way from the individual techniques) a discussion of the dissonance within the group. This has the objective of allowing the individuals to reconsider their own ideas in light of those of the others;
- the final verification of trustworthiness. This phase must permit the production of conclusive data and estimate the trustworthiness of

the information produced (through a measure of the consensus between the participants and of the dynamism of the sensemaking processes).

These techniques are mainly used to support process of programming/planning and evaluation, but some authors consider them useful for working with young people. MacPhail (2001) addressed some of the studies that had applied NGT and highlighted its usefulness in:

- incorporating college students' perspectives into assessment (Farone, *et al.*, 1998);
- prioritising implications for vocational teacher education (Frantz, 1997); evaluating college students' teaching and learning experiences (Chapple and Murphy, 1996);
- identifying and ranking problems faced by students in an inner-city school (Gerdes and Benson, 1995).

Furthermore, this author sustains that "group techniques are popular methods for working with young people for a variety of reasons" (MacPhail, 2001, p. 161), in particular because:

- "participation is balanced among group members";
- "there is no need for respondent validation of the data as the members of the group have themselves weighted the importance of statements in the process of engaging in NGT";
- "the researcher's confidence in undertaking such a process is likely to be increased by avoiding the distractions of note-taking and tape-recording typical in other group interview formats" (MacPhail, 2001, p. 162).

From individual maps to the construction of shared concepts: an integrated process

The nature of research processes that are based on the reconstruction of the cognitive structures and the activation of sensemaking processes makes them particularly suitable for use within more complex and integrated research plans. Moreover, the two approaches described above can be integrated when the informative goals require the activation of sensemaking processes. The utility of developing an integrated approach lies in the possibility of combining the attention placed on the individual dimension (and respect for the cognitive structures of the subjects

involved) with the intrinsic potential of techniques that encourage discussion, the re-evaluation of the cognitive maps and the construction of shared meaning structures. The process can be broken down into two macro phases: i) reconstruction of the cognitive maps of the actors involved in the process of knowledge construction; and ii) analysis of the cognitive maps and the activation of sensemaking processes.

i) Macro phase one: reconstruction of the individual cognitive maps
The research process starts with the reconstruction of the cognitive maps of the actors involved; it is essential that conditions are created that facilitate the evaluation of the cognitive structures explicitly used by the individuals, as well as allowing fragments of knowledge to emerge that are not yet sufficiently processed into clear cognitive schemes. Thus, data collection must activate a creative process that is also able to let knowledge emerge that has not yet been formalised or consolidated. This macro phase must be organised into two fundamental steps: the preparation of the meeting with the participants, and the generation and communication of ideas.
- Preparing the meeting and defining the focus of the mapping project. During the process of identifying and involving the participants, it is also important to collect some socio-biographical data that can aid the interpretation of potential differences in the results. The clear definition of the focus upon which participants must direct their attention forms a fundamental element in the preparation phase. From this perspective, it is also useful to define precisely the limits within which discussions must remain (i.e. what must not be considered because it is secondary to the study focus). Moreover, the methods to use for gathering the conceptual materials must also be prepared in advance (questions, administration rules, etc.) as well as all the possible ways of processing the data collected. Indeed, a detailed research plan must be drawn up, where the times, places and methods for putting the project into effect are defined (Bertin, 2011).
- Generation of ideas. This phase of the process has the objective of identifying the group of concepts to use in the analysis. In practice, it involves the activation of an open discussion among the participants. Kane and Trochim (2007) suggest that importance is placed on the use of specific techniques for the management of creative processes, like brainstorming for example, but other techniques can also be used that stimulate creativity, such as role playing. A second strategy that can aid the creation of the

groups of concepts to analyse regards the analysis of existing texts, performed using content analysis techniques. The resulting material must then be made usable and contain a limited number of items (Rosas and Kane, 2012). The quantity of creative material produced can be reduced by analysing their linguistic structures (equivalent or very similar items). To simplify the successive phases, it is important that the statements used to represent the items are simple, uni-dimensional and contain key words.

ii) Macro phase two: analysis of the cognitive structures
The analysis of the items collected can follow two different strategies, not necessarily interchangeable¸ but that focus on two different aspects: the constructivist approach; and the approach based on the analysis of logical connections.

The constructive approach recommends that analysis of the cognitive structures is organised as follows:

- Structuring of ideas. In this phase, participants are asked to reorganise the various items by grouping those that have conceptual connections. As previously discussed, the participants consider the items that present one or more conceptual similarities as connected. Various strategies for sorting items have been suggested in the literature. Trochim (2005) suggests, for example, that each item is written onto a card and then to make piles of the cards that are considered to belong to the same group (by semantic closeness or logic). In this way, the individuals are forced to choose, obliging them to identify, for each item, those with the strongest connections, or to use specific software that helps process the data. There is no maximum number of groups of items, nor a minimum number of statements per group, but it is important that the actors feel free to represent their personal cognitive map. Each participant is then asked to assign a name to each group of items in order that the most prevalent semantic dimension (or the main focus) is able to emerge;

- representation of the ideas in maps. Map construction is performed via a quantitative analysis of the relationships between the individual items, represented by the groups of items made by each participant, and by their evaluations. For each participant, it is possible to construct a symmetrical matrix by placing the same item on both the x- and y-axis. We will call this the "personal" matrix. The value of each individual value within the matrix, which represents the connection between two items, will be equal to one if

the two items belong to the same group (in other words, if they were placed in the same group during the previous phase), however it will be equal to zero if the items are not related and were, therefore, placed in different groups. At this point, it is possible to obtain a general matrix by summing the individual personal matrices. For each cell, the values will vary between zero, when no participant signals the presence of an important relationship (i.e. that the single item does not present strong relationships with any of the other items considered), and a value equivalent to the number of participants, when all have considered that relationship to be important. The matrix obtained can be analysed using various statistical techniques. In particular, the literature suggests the integrated use of Multidimensional scaling, in order to identify the stress value, followed by Hierarchical cluster analysis. This process allows a number of classes (clusters) to be identified that compose the semantic spaces within which the items are placed and that, by combining them, constitute the (prevalent) cognitive map of the group;

- interpretation of the results. The interpretation of the results is usually done together with the participants or at least with some of them. In the analysis phase, the other information collected are also recovered and in some cases consensus method techniques can be used to stimulate the identification of the single items relative to the informative problems (importance, evolution, diffusion, etc.).

The approach is based on the analysis of logical connections (Bertin, 2011); it does not have the classification of the cognitive maps of the actors as its sole objective, contrary to the constructivist set-up it, but it also activates a process of sensemaking that permits the production of shared concepts. To this end, it tries to highlight the differences as well as the linguistic and semantic overlaps, and to order the concepts via the construction of semantic structures that were previously unclear or not explained by the group. This process moves into the logic of sensemaking as a process of reducing complexity.

A first element of complexity is attributable to the linguistic forms used by the participants. Often the actors involved express the concepts using language that is partially different, or enclosing concepts in the same statement that in part belong to different semantic worlds. Another type of problem regards the level of abstraction used by the individual participants in representing their ideas. The linguistic forms used may contain

statements that regard abstract elements, close to the concepts, or concrete and directly observable elements.

The organisation of the items produced via the reconstruction of cognitive structures can be achieved by following three different and specific steps. These steps correspond to:

- a linguistic analysis. The researcher will reclassify all the items, comparing them from a strict linguistic point of view. This work starts by grouping linguistically similar items, in order to identify potential overlaps and to group them under a unique linguistic form. This work is necessary because the phase of reconstructing the cognitive structures must be focused at allowing all the linguistic structures used by the actors involved to emerge. The emphasis on the exhaustivity pushes for the inclusion of all the cognitive material produced by the actors, postponing their critical analysis;

- a semantic analysis. This process takes into consideration all the items that result as linguistically different, in order to consider whether they are also semantically different. Focus is placed on the items that, although presenting linguistically different structures, could belong to the same semantic area. Indeed, it is possible that different actors, bearers of specific (or rather specialist) culture, use different languages (or partially different) to represent the same concept. It is then also verified whether some items contain, within them, aspects that can be ascribed to more concepts. The objective is to formulate a group of items that are independent between themselves (not connected by reciprocal influences that make them comparable) and unidimensional (that represent a single concept). This is the most delicate phase of the work of shared decomposition of the concepts. The work of classifying the individual items must permit the clear definition of meanings to assign to the statements recorded. In this phase of the work, it is not necessary to refer back, in a rigorous manner, to the linguistic forms used by the participants in the creative phase. The importance is instead placed on maintaining the semantic character of the emerging statements;

- a hierarchical analysis. This type of analysis must allow statements to be placed on the same abstraction level in the scale that runs from the concept to the directly observable indicator. The classification of the items along the abstraction scale also allows concepts to emerge (or their specifications) that did not do so previously. If, for example, the reconstruction of the

cognitive structures led to the emergence of indicators of the phenomenon to analyse, without the emergence of other items able to represent the concept expressed by the indicator in question, then a "hole" is revealed in the cognitive map. In this case, the researcher should stimulate a debate between the actors (at this point, the circular nature of the phases of cognitive map reconstruction becomes evident) to make the concept emerge that is specified by the indicator but not represented by the analysis. This situation occurs when a discussion on practices is held and the system of meanings that they activated is lost from sight.

This type of work is fundamental for enabling discussions to arise, starting with directly comparable ideas (inasmuch as that they belong to the same abstraction level).

The two approaches (table 3) to concept analyse presented here start from perspectives that present differing critical issues and potentialities.

Table 3. Informative objectives and approaches to the reconstruction of shared cognitive maps

Informative Objectives	*Concept mapping*	*Logical analysis concepts*
Analysis of the semantic structures	Yes, it regards the initial items, the linguistical analysis is useful for reducing the number of items and for simplifying the analysis	No, the excessive emphasis on the semantic dimension unbalances the linguistic forms on the rational dimension to the detrimental of the emotive and symbolic dimension
Sensemaking and the sharing of semantic structures (concepts or criteria)	No, the necessity to respect the linguistic forms does not allow the activation of sensemaking processes (new items emerging from the debate)	Yes, integration with concept mapping logic is useful for respecting the cognitive structures of the actors involved

The perspective indicated by the constructivist approach is more interesting from the point of view of its capacity to represent the cognitive maps of experts. The critical factors are attributed to:
  - the necessity to activate a real debate between the subjects involved and not only represent individual points of view;

- the incapacity to question the cognitive structures used, since the end goal that led to the development of this methodology is mainly analytical;
- the impossibility to compare directly the individual items without having them re-processed in order to render them semantically independent.

On the other hand, the approach based on the analysis of the logical connections redirects the process of revision of the cognitive structures to the researcher. However, this arrangement brings with it the risk that the final result may be affected by the researcher's own cognitive maps and may not activate a process of re-elaboration and concept sharing between the experts.

The two approaches, however, can be considered complimentary and rearranged in function of the informative objectives and the techniques used in the data collection process. An integration of the two research perspectives could follow a strategy organised as follows:

linguistic analyses;
- construction of concept groups by each individual;
- construction of the "personal" matrix of each individual;
- construction of the group matrix;
- identification of the semantic areas;
- semantic analysis per area;
- validation and confirmation of the exhaustivity of the elements collected.

In this way, the importance of starting from the re-elaboration of each cognitive structure of each actor can be balanced with the necessity to make clear: the linguistic doubts, the semantic overlaps and the research into the logical exhaustivity of the conceptual material produced.

The success of the strategy depends on:

a good knowledge of the topic addressed by the research;
- good theoretical reasoning and logical analysis abilities in the researchers;
- the ability to take into consideration all the observations emerging;
- the ability to make the most of the contributions obtained from all the participants;
- the ability to avoid the centrality of the researcher's cognitive map;
- the capacity to stimulate debate.

Conclusions

Analyses based on the comparison of the knowledge of the participating actors must start with the sharing of the semantic structures used by each actor. The very wide variety in experiences and in their autopoietic re-elaboration tends to diversify the languages and the semantic structures of the concepts used. This process of diversification requires a reformulation of the concepts, which cannot be excluded from shared sensemaking. Sensemaking starts with the verification of the semantic dimension of the cognitive maps of the individual actors and activates a reciprocal stimulation that can allow shared concepts to emerge and their form of meaning. The literature presents different lines of research into these aspects and suggests some meta-criteria for the verification of the validity of the process.

The first part of reconstructing the items used to represent the concepts that are useful for the analysis process must verify:

- the exhaustivity of the list of items considered. Indeed, this test controls the goodness of the work done during the phase of reconstructing the cognitive structures and allows the verification of whether certain elements of analysis were overlooked that could play an important role in the study. The process of controlling the exhaustivity of the work is performed by asking the experts whether during the development of the analysis it would have been useful to have had further information to hand, relative to aspects that were not considered. If it emerges that further information were necessary, it means that other aspects exist that need to be brought to light. The process will end when the experts do not retain the addition of any new information as being useful for the study.

Non redundancy of the items. This control allows the verification of whether the list contains items that, apparently, represent different aspects of the problem, but, substantially, occupy the same semantic space. The literature suggests the consideration of two items at a time, to fix the real meaning of the first and to verify whether any further elements can be added by also considering the second element. This process can produce three different situations. In the first case, the second item contains elements that are significantly different to those expressed by the first. The research should, therefore, consider both of elements. If the second does not bring any added element of reflection to the development of the

analysis, then it can be considered that the elements are equivalent and the one that is least clear or more difficult to operationalise should be rejected. However, it is often the case that the comparison brings to light the existence of margins of overlap that are only partial. In this case, work needs to be done to define a single concept that comprises all the important elements, or, if the areas of overlap are minimal, to redefine two different criteria that no longer overlap. In this phase of the work, the comparison of the semantic structures used by the experts allows the goodness of the research process to be verified.

The second part of the analysis of the semantic structures and of the activation of sensemaking processes must consider the following:

- the validity of the semantic analysis. As already highlighted, one of the possible distorting factors is attributable to the role of the researcher, who risks using his own cognitive maps when analysing the semantic overlaps. To verify this potential error, two researchers can be asked to perform the semantic analysis in an independent manner; the two sets of separately produced results can then be compared. The potential discrepancies emerging from the comparison of the two analyses can be addressed by reconstructing the logic followed and the cognitive maps (meaning structures) used in order to aggregate and decompose the individual items;

- sharing. The work of redefining the semantic structures must, in the end, be validated by the group of experts involved in order to avoid: i) the possibility that the real semantic meaning intended by the statement considered was not understood; and, ii) that certain nuances or emphases are missed that were important to the participant who formulated them. The quality of the creative work and of the conceptual organisation of the material is fundamental to allow positive conditions to be established for the development of the successive phase, and to avoid having confused concept definitions, which would threaten the validity of the process.

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