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Polyphonic Imagination: Understanding Idea Generation in Multidisciplinary Groups as a Multivoiced Stimulation of Fantasy

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ABSTRACT

The primary objective of this paper is to offer a new way of understanding the creative processes of multidisciplinary groups, whose work is to generate innovative ideas. The paper reports from a project focused on organizational creativity at the group level, investigating what characterized such creative processes in that context. This project used ethnography as a qualitative method including participant observation, focus group interviews, and individual qualitative interviews. Furthermore, an inductive approach was used to analyze the data. Findings showed that when group members from different disciplines collaborated on innovative idea generation, the creative processes were characterized by a multivoiced stimulation of fantasy. In the paper, we first discuss how imagination involved new ways of combining knowledge and ideas based on one's own and others experiences, including the use of technological tools. Secondly, we discuss how imagination was ignited by diversity and tension. Thirdly, we elaborate on the importance of emotion and support for the drive and stimulation of imagination in groups. Finally, we sum up the discussion by presenting a model based on the concept of Polyphonic Imagination, in order to visualize the characteristics of the creative processes. We propose this concept of Polyphonic Imagination, derived from the empirical data, to designate the ways in which different perspectives in the groups created tensions that fed into the group members´ imagination whenever these perspectives acknowledged each other.

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Introduction

In order to survive fast changing market environments, organizations need to stimulate creativity and become innovative. As firms continue to place a premium on the new and novel product and service offerings, as drivers of their competitive success and survival (Baer & Oldham, 2006), there is a clear imperative for researchers to unpack the pathways leading to creativity. Consequently, organizations must have methods, toolboxes, and processes that can advance and support all the phases of the innovation process (Darsø, 2001). In today's knowledge societies, knowledge is key to innovation and it is widely accepted that innovations are brought forward in an interactive process consisting of knowledge development and application. As a result, organizations engage in generating and applying new knowledge in order to achieve innovation.

As such, there is a need to understand the particular creative processes leading to innovation. Consequently, organizational creativity, defined as *the production of novel and useful outcomes (products, services, processes, etc.) by people working together* (Woodman, Sawyer, & Griffin, 1993, p. 293), has become an important focus in organizations.

Findings from the large ethnographic study this paper is based on (Ness, 2017; Ness & Riese, 2015; Ness & Søreide, 2014) have shown that the generation of innovative ideas and the production of novel outcomes do not happen automatically. In the groups studied, it was not enough to bring together competent individuals from different disciplines. The creative processes were relational and, indeed, required a dynamic co-construction of knowledge and ideas between group members.

This relational formulation of creativity goes against the traditional view of this phenomenon, which typically considers it as an individual trait (Amabile, 1996, 2008; Barron & Harrington, 1981; Feist, 1998). Instead, this paper is in line with more recent research on

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Author note

The title of the special issue is *Creativity, learning and technology*. It comes out of an international symposium held in Geneva on the 7th of December 2017, co-organized by the Webster Center for Creativity and Innovation (Webster University Geneva) and the Center for the Science of Learning & Technology (University of Bergen). The co-editors were Vlad Glaveanu, Ingunn Johanne Ness and Constance de Saint Laurent.

creativity that includes the dynamic relation between the self and others, promoted, among others, by John-Steiner (2000), Sawyer (2003) and Glăveanu (2010). In this paper, we thus aim to formulate a relational and dialogical account of creativity and support it with research findings from a study of innovation in multidisciplinary groups.

We will first briefly review the literature on creativity at an individual and social level and outline the need for a more dynamic approach. This is the rationale behind our sociocultural framework. Then, the method of the study and a few key findings are presented. We use these analyzes as a point of departure for the discussion on Polyphonic Imagination, a concept that characterizes the creative processes in the groups that were investigated. We argue that innovative ideas emerge out of a Polyphonic type of Imagination – the relational and multivoiced stimulation of fantasy in which different voices acknowledge each other. Finally, we summarize the findings in a model focused on the characteristics of group creative processes.

Vygotsky used the notions of imagination, fantasy, creativity, and creative imagination almost interchangeably, stating that in psychology creative activity is called imagination or fantasy (Glăveanu, Karwowski, Jankowska, & de Saint-laurent, 2016). In this paper, we follow this and do not go into the distinctions and differences between these concepts.

Gaps in our knowledge of group creativity

When we look at organizational creativity in the literature, we see that there have been mainly two broad approaches to organizational creativity; one with a focus mainly on the individual, and another with a focus mainly on groups and group interactions (Diehl & Stroebe, 1991; Paulus, 2000; Paulus, Larey, & Ortega, 1995). In both these research streams, however, there is often a separation between the individual and the social and, thus, a need to investigate further the relational dynamics *between* the social and the individual – what happens in-between people as they engage in creative processes together.

In response to this gap, a third research stream has emerged; i.e., research that has increasingly tried to explore collaborative creativity (Hargadon & Bechky, 2006; John-Steiner, 2000; Kurtzberg & Amabile, 2001; Sawyer, 2006) and collaborative knowledge creation (Carlile, 2004; Dillenbourg, 1999; Hämäläinen & Vähäsantanen, 2011; Hargadon & Sutton, 1997; Mercer, 2010; Paavola & Hakkarainen, 2005; Tsoukas, 2009). These social and collective views claim that knowledge and creativity emerge in the interactions between people and, as such, focus more on the interaction than the skills and attributes of each individual.

This paper explores further such a sociocultural viewpoint, which focuses on the dynamic between the social and the individual, between self and others, and, in particular, on the collaboration itself (see Glăveanu, 2010; John-Steiner, 2000; Sawyer, 2003). Along with these authors, we acknowledge the need to investigate creativity as a relational process. In this paper, relational processes include the collaborative and interdependent co-construction of meaning, knowledge, and ideas between group members from different disciplines. Furthermore, they also refer to the emotional or affective climate within an organizational context.

The point of departure for the theoretical framework is thus a sociocultural perspective on knowledge development with an emphasis on how ideas are co-constructed in social interactions which include supportive as well as challenging dialogs.

A sociocultural view on knowledge development

The theoretical framework rests primarily on sociocultural premises regarding knowledge development, and on the idea that knowledge emerges and develops through a process of dialogic co-construction. This co-construction is assumed to take place in the context of an active and dynamic relationship between the social and the individual. Humans exist and develop in intellectual interdependence and social interaction, and they co-construct their knowledge through this interaction (Linell, 2009; Valsiner & van der Veer, 2000).

In this article, we will examine some basic assumptions of socio-cultural theory and particularly the concepts of "imagination" and "dialogue and polyphony" by focusing on the scholarship of Lev Vygotsky (1886–1934) and Mikhail Bakhtin (1895–1975).

Imagination

Imagination is, according to Vygotsky (1930/2004), oriented toward the future:

> It is precisely human activity that makes the human being a creature oriented toward the future, creating the future and thus altering his own present. This creative activity, based on the ability of our brain to combine elements, is called imagination or fantasy in psychology (Vygotsky, 1930/2004, p. 9–10).

For Vygotsky, "imagination, as the basis of all creative activity, is an important component of absolutely all aspects of cultural life, enabling artistic, scientific, and

technical creation alike" (Vygotsky, 1930/2004, p. 9). Even though Vygotsky's work on creativity remained incomplete (Moran & John-Steiner, 2003), his thoughts on imagination help us to understand the act of creation. Smolucha and Smolucha (1986) point to how Vygotsky saw imagination as a higher mental function and a consciously directed thought process. Creative thinking involves the collaboration of imagination and thinking in concepts, which is the case for both artistic and scientific creativity. Even though Vygotsky focused on adolescence as the phase when imagination first develops in all its complexity (John-Steiner, Connery, & Marjanovic-Shane, 2010), this ability continues to grow throughout a person's life span. Thus, it has relevance also in groups of adults.

Based on the above, this paper conceptualizes imagination as a higher mental function, mediated by psychological tools (for instance the way the group members used language and terminology in their communication) but also other technological tools used to help them convey their meaning to the others. Vygotsky (1930/2004) considered imagination a process directly connected with meaning-making. Imagination is, according to Vygotsky, the process whereby the mind takes up known elements and uses and combines them in new ways. An individual's capacity to make connections between objects, events, and tools in his or her life is directly defined by how much that person can imagine someone else's experiences. Imagination, "becomes the means by which a person's experience is broadened, because he has to imagine what he has not seen, can conceptualize something from another person's narration and description of what he himself has never directly experienced" (Vygotsky, 1930/2004, p. 17). As group members have different knowledge and experiences, the use of imagination can shed light on how they learn from each other's knowledge and experiences. Vygotsky postulated that imagination and the growth of creativity was shaped primarily by the amount and variety of a person's knowledge and life experiences (Vygotsky, 1930/2004).

Dialogue and polyphony

In order to explore creative knowledge processes, we focus here on how the group members communicate and interact when generating new ideas. The notion of dialogue is thus crucial to examine meaning making processes and the development of new knowledge and understanding that often emerge in the tension between different perspectives (Dysthe, 2001; Igland & Dysthe, 2001; Morson & Emerson, 1990).

Dialogue is a central concept in the work of Mikhail Bakhtin, comprising both an ontological and an epistemological understanding. Dialogue was, according to Bakhtin, both a fact of life and, at the same time, an ideal to strive for. In this paper, we draw on Bakhtin's notion of dialogue which focuses on how meaning, knowledge, and creativity are developed in the tension between different voices. Secondly, we draw on the way dialogue acknowledges different voices in order to avoid a mind-set that is monological (i.e., dominated by a single perspective).

Bakhtin claimed that: "A dialogue is a combination of voices, it is polyphonic. The voices in a dialogue are persons speaking 'in concert', but a person engaged in a dialogue is not restricted to one voice" (Graumann, 1990, p. 108). The concept of dialogue is thus closely connected to that of polyphony. Polyphony is a concept borrowed from music that acknowledges the presence of many voices without any one voice being superior to the others. Bakhtin's perception of polyphony is normative in the sense that it implies that no authority is dominating and everybody's voice is equally important. Polyphony, which literally means "many voiced", was used to describe literary writing that managed to liberate the voice of characters from the authorial or narratorial voice. In *Problems of Dostoevsky's Poetics*, Bakhtin (1984) referred to polyphony as a new kind of artistic thinking because what Dostoevsky did went against the grain of the traditional narration, privileging harmony and single voicedness. The reader of Dostoevsky, Bakhtin suggests, does not have the impression that he or she is dealing with a single, dominating author, but is, in fact, faced with a multiplicity of authors.

Polyphony refers, therefore, to the process whereby many voices interact together and it acknowledges the tension between voices this interaction might lead to. For Bakhtin, this implies that participants in a dialogue must have an open mind in relation to others, as it is in the tension between different voices that knowledge and meaning are created.

> The idea *lives* not in one person's *isolated* individual consciousness – if it remains there only, it degenerates and dies. The idea begins to live, that is, to take shape, to develop, to find and renew its verbal expression, to give birth to new ideas, only when it enters into genuine dialogic relationships with other ideas, with the ideas of *others*. Human thought becomes genuine thought, that is, an idea, only under conditions of living contact with another and alien thought, a thought embodied in someone else's voice, that is, in someone else's consciousness expressed in discourse.

> At this point of contact between voice-consciousness the idea is born and lives (Bakhtin, 1984, pp. 87–88).

The idea – as it was *seen* by Dostoevsky the artist – is not a subjective, individual or psychological formation with "permanent resident rights in a person's head; no, the idea is inter-individual and intersubjective – the realm of its existence is not individual consciousness but dialogic communion *between* consciousnesses" (Bakhtin, 1984, p. 87–88).

Bakhtin's view is that, in any idea generation process, dialogical relations are necessary. Different points of view can develop further and new ones emerge in the meeting between different perspectives, as also Glăveanu and de Saint Laurent (2018) explored. The concept of polyphony is relevant concerning the understanding of how an open dialogue enables creative processes instead of suppressing it and limiting the chance for innovative ideas to be generated. When multidisciplinary group members communicate and interact, there are challenges involved. Rickards and Og De Cock (2009) made an overview on brainstorming and concluded that this can be ineffective when it comes to problem-solving because individuals often have more ideas than people working in groups.

In multidisciplinary groups, group members may have different terminologies which often leads to communication problems and may make it difficult to understand each other. Thus, it becomes crucial for the outcome of the group work that the members manage to have a dialogue and to overcome the obstacles involved in multidisciplinary collaboration. This is nesecceary in order to benefit from such group collaboration – combining the knowledge that can lead to something new.

The sociocultural framework above enables us to explore the creative processes in the multidisciplinary groups and to focus on the social interactions and how group members co-construct new knowledge and ideas across disciplines.

Methods in the ethnographic study

With the overarching research question "What characterizes the creative processes in innovation work?" as a point of departure, the first author conducted an inductive and qualitative research study (for more, see Ness & Søreide, 2014; Ness & Riese, 2015; Ness, 2016). The empirical fieldwork focused on three purposefully selected groups (Flyvbjerg, 2006, p. 230), two located in an International Oil and Gas Company, Statoil, and one located in a Research Institute. The sites were chosen due to the opportunity to follow authentic creative processes in leading innovation organizations. The groups were chosen due to their formal mandate on generating new ideas, strategies or products. All the groups consisted of people with varied educational and experiential backgrounds, as follows:

- A Strategy group: based in the international Oil- and Gas company, Statoil. (Now called Equinor). This group consisted of people with legal and on/offshore expertise, included logistics and engineering.
- An Innovation group: based in the Innovation Department in Statoil. This group had members with expertise in engineering, business, geophysics, and cyber technology.
- A Research Institute group: based in a Norwegian Research Institute, also with people with different competencies and expertise.

When investigating the characteristics of creative processes in these contexts, it was necessary to spend time with the groups, in their work environment, and "get a feel" for how they communicated and used artifacts. It was also crucial to see how the leaders facilitated creative teamwork. Since we aimed to observe how the group members communicated and interacted over time, an ethnographic approach was chosen for data collection. An ethnographic perspective can capture how new ideas are generated and operationalized in heterogeneous teams (Lund, Rasmussen, & Smørdal, 2010, p. 217), and this perspective was well suited to help us study both the visible and less visible processes of creativity. In addition to observations, we also conducted focus group interviews with the three groups and individual interviews with group leaders and other innovation leaders. In order to conduct the study, the first author had to pass courses on safety, since it was a requirement for getting access to buildings and meetings, and in order to freely come and go as "one of the group members". Since innovation is a highly business sensitive field, it was necessary to sign confidentiality statements. These gave us some restrictions regarding reporting the content of the innovation processes, so that is why we use often use "[…]" in quotes when reporting data. Using such brackets indicates that confidential content is removed, yet we are still able to report *how* the group members communicated and interacted and describe the creative processes.

The observations were audio or video recorded, and the interviews were audio recorded and transcribed before the analysis. The project has an empirical point of departureand is inspired by Hatch's (2002) inductive analyzes, but it was also theory informed. In

ethnographic research, theory plays an inductive role in the sense that theoretical insights inform the interpretations of data uncovered, not by testing prior theoretically driven hypotheses but in using the researcher's theoretical knowledge to make sense of the data uncovered in the field research (Wilson & Chaddha, 2009). In this inductive approach, we sought to identify different patterns which describe how the communication and interaction in the groups varied throughout the idea generation process. In this way, it was found that there was indeed an overarching pattern across the groups indicating that creative processes took different forms and different levels of intensity at different times during the innovation work. When analyzing further, six phases were identified: the initiation, knowledge distribution, polyphony, imagination, idea formulation and consolidation phase. Excel was used for coding and organizing the material. This enabled us to organize the material according to descriptions of the identified phases in a structured manner. In this way of inductive analyzes, data were investigated with the research question in mind as a point of departure and when repeated ideas, concepts, and patterns became apparent, these were tagged with *codes*. The codes represented different categories or themes of meaning. For instance code, A3 would represent "Category A, Curious state of mind: communication and interaction where group members seem open and curious towards each other" and 3 indicating that this happened in phase 3 (polyphony) of the idea generation process. These categories became the basis for a new theoretical model. They allowed us also to see how communication and interaction varied from phase to phase, from the macro level of the entire collaboration to the micro-level of the utterance. This inductive analytical approach (Hatch, 2002) was combined with an hermeneutical interpretation of the meaning and it was inspired by Kvale and Brinkmann (2009, pp. 213–218). Consequently, it was possible to write a description of the creative processes throughout the phases.

The identified phases and their characteristics were then used as a base for focus group interviews with the members of each group, which were conducted in order to discuss and elaborate our preliminary findings. The results from the analysis of focus group interviews resulted in a richer description of each of the six phases of creative processes. Finally, individual interviews with group leaders were also conducted in order to understand more of the leaders´ role in the facilitation of the creative process.

Main findings

Findings from this project showed that the creative process developed over time and six phases had been identified for this initial innovation work. These six phases could be divided into two separate processes in which: 1) the groups, through knowledge sharing, built a common knowledge platform, and 2) this platform enables idea generation. The creative processes peaked in the three middle phases and these phases have been metaphorically called the "Room of Opportunity" (Figure 1). Within it, group members discussed different scenarios and ideas, different views were put up against each other resulting in a polyphony where everybody's meaning was equally valuable; this dialogue stimulated group members' imagination. Participants also used each others' experiences in order to learn and to think about new combinations. When doing this, they used a variety of technological tools. Knowledge was widely distributed among group members and, as such, they tutored each other. It depended on the task which of the group members who knew most about the task.

The analyzes also showed that, when group members from different disciplines construct a common knowledge platform and generate or develop innovative ideas, some relational skills become crucial in order to succeed. Most of all, they require the ability to recognize and build on each other's competences. This process

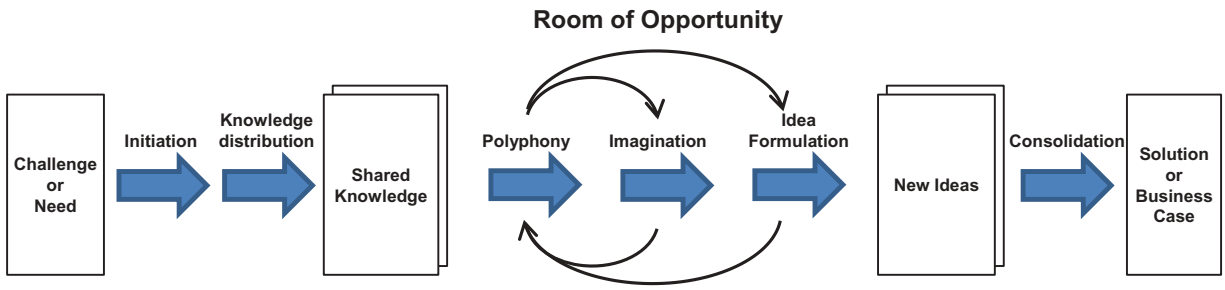

Figure 1. Model of "The room of opportunity"; revised version (Ness, 2018).

was aided by openness, curiosity, and respect for each other's views. It is insufficient to simply assemble people with special expertise and from different disciplines. They need to exercise these additional relational skills in order to accomplish their task creatively (Ness, 2017; Ness & Riese, 2015).

An overall finding was that, across all three groups, discussions and disagreements stimulated group members' fantasy and imagination which were crucial for the creative process, particularly within the "Room of Opportunity". As following, we will focus in particular on how a polyphonic form of imagination stimulated and gave direction to these creative processes.

Idea generation in multidisciplinary groups as an expression of the polyphonic imagination

Findings from the first author's project showed that the groups' imagination was stimulated by the existence of multiple voices and perspectives within the team, and that these different perspectives acknowledged each other and didn't allow any particular voice to become dominant.

We will first discuss how imagination involved new ways of combining knowledge and ideas based on one's own and others' experiences and the way the groups made use of technological tools. Secondly, we will discuss how imagination was ignited by diversity and tension. Thirdly, we elaborate on the importance of emotion and social support for stimulating and driving imagination in groups. Finally, we will sum up the discussion and present the concept of Polyphonic Imagination and a conceptual model.

Imagination: combining knowledge in new ways

Being imaginative was observed in those moments in which group members combined their individual knowledge and experiences in new ways (Jovchelovitch, 2015, p. 79), and implied that group members listened to others' experiences and included what they heard in the repertoire of their own knowledge and experiences. We will explore this dynamic in more detail as follows.

Indeed, when observing how group members generated ideas it became evident that they borrowed elements from the knowledge they already possessed and combined them in new ways in their discussions with other group members. This was especially noticeable during the many presentations in the groups where different terms and concepts were explained and demonstrated in detail. In particular, group members made use of a variety of technological tools as a supplement to their verbal explanations. This included different software systems, as well as the use of pictures, models, and figures. These presentations helped the members to combine knowledge in new ways since they learned from each other and developed a new perspective on their knowledge. They frequently expressed new insights derived from what they were explaining or demonstrating to the others.

A typical example on how the groups made use of technology in the idea generation, was when the group members in the Innovation group stood in front of a white board and Eric[1] started to draw and explain a particular system connected to drilling. Then, another group member supplied his understanding by adding to the drawing and also making changes in what Eric had suggested. Other group members joined in and started drawing, building on each others' knowledge. The technological tool made it possible to save what they were doing and the group could go back and forth between the different stages of the drawing. They were able to revisit their work and their ideas also at a previous state and to explore other ways by changing the drawings.

The group members also searched for new possibilities to build on each others' knowledge and perspectives. Hannah, another member of the Innovation group expressed it like this (Ness & Søreide, 2014, p. 553):

> Participation and enthusiasm is important – and building on each other's ideas and perspectives. When there are several people in the group with different competences, you get this dynamics which is so important. You are challenged by others. You learn to think in a new fashion when you hear how others talk about matters you thought you knew.

Evidently, in these groups, the members were true experts within their field. However, this also means that they lacked equivalent knowledge in the others' fields of expertise. According to Vygotsky (1930/2004, pp. 14–15): "The richer a person's experience, the richer is the material his imagination has access to". Consequently, it was crucial that the group members could share knowledge and experiences in order to get a wider and richer individual knowledge, as well as a broader common knowledge platform to support their imagination. Vygotsky (1930/2004, p. 17) claimed that imagination is essential for all mental functioning and human behavior because it also broadens a person's experience, thus, the person " … can venture far beyond these boundaries, assimilating, with the help of his imagination someone else's historical or social experience". Indeed, the individual's capacity to make connections between objects, events, and tools are directly defined by how much that person can imagine

someone else's experiences. Technological tools were used as mediation that enabled the group members to visualize their thoughts and invited others to add to these with their own ideas. Following Vygotsky, imagination is not only built on a person's own, real experience, but also on the experiences of others with whom he or she communicates about shared situations.

Imagination ignited by diversity and tension

Tension and diversity can stimulate imagination and Bakhtin's concept of polyphony highlights how knowledge and ideas are created in the tension between different voices acknowledging each other (Morson & Emerson, 1990). In order for meaning, new knowledge, and understanding to emerge, there must be a dialogue between several perspectives or voices, and it is particularly productive if these voices are in opposition. Previous research also shows that discovering how knowledge and assets, redefined and connected in novel ways, requires heterogeneous networks of people. Such networks can expose people to a diversity that can inspire and enable creativity (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Woodman et al., 1993) as it can create a fruitful tension between positions and perspectives. This proposition is supported also by our ethnographic study.

In the present research project, we had seen that in the oil industry, groups could especially draw on differences in their operational and theoretical views. One of the group leaders made this comment about seeking new perspectives; "It was important to keep on seeking and not stop the discussion immediately when a solution came to the fore" (Helge). However, the leader emphasized that differences in perspectives were also present between group members who did not possess opposite perspectives: "It was nice that this group consisted of people from different departments. But even though some in the group normally work closely without many controversies, they still could propose different perspectives".

An example of the difference in opinions between persons with similar backgrounds came to the fore when Birger – a member from the contract unit in the Strategy group – and the leader, coming from the contract unit, disagreed. Even though they both represented the contract unit, and therefore shared a common perspective, they had different opinions on what focus to have on drill string and assemblies. Through dialogical exchanges where they discussed different ideas, the group came further than what would have been the case if group members had sought an early agreement. Through such moments of tension, the group continuously created knowledge and ideas, without generating a conflict. We also found that group members did not automatically seek an agreement. According to Graumann (1990), group members do not have to agree – but they must be able to express an understanding of the other person's perspectives. As shown in the example with Birger and the leader, it is possible for the group members to disagree and still maintain an intersubjective field of mutual understanding. This is in line with Matusov's (1996) argument that the traditional conception of intersubjectivity is too narrowly defined and too static in order to fully account for the fact that individuals are different. It is not fruitful to focus on agreement only, and what individuals have is in common. Matusov argues that intersubjectivity might also include lack of agreement or continuity in joint activities.

The way group members communicated implied disagreements since the perspectives and voices came from different practices and disciplines, but it was exactly this polyphony that allowed the groups to move beyond the existing knowledge of various experts and toward a territory new to all of them. In this way, the polyphony of disciplinary voices became a generative juxtaposition (Baerveldt & Cresswell, 2015) for each one of the groups.

Emotion supports the imagination

A sociocultural perspective sets out to examine learning and how common situations can trigger encounters that are not only socially and technologically mediated, but also emotionally charged. Understanding the emotional dimensions of the collective effort to collaborate on generating innovative ideas is important for organizational creativity and for the leaders working with these processes. When looking at the findings across the three groups, it became clear that emotions and social support were connected to how imaginative the groups became. We will discuss in this section how emotions supported the polyphonic imagination.

From the interaction we could see how group members related to each other in humorous ways, sometimes using jokes to increase the affective bonds in the groups and to build positive relationships with each other. Emotional safety and respect were essential conditions for imagination and creative acts such as generating new ideas.

An example that shows how the social climate was seen as important for the imagination was when Eric explained, in a follow-up interview, that he wanted group members to have a good time:

> "And I want laughter and fun! I want energy and activity and just notice: when everybody in the room is up on their feet, when there are voices and laughter blending together, then we are on to something!" (Ness, 2017, p. 568).

When Eric said this, he shared his awareness of the connection between active participation, laughter, fun, and creativity. Bakhtin (1981) emphasized the creative energy embedded within polyphonic dialogs and the leader acknowledged this by saying that they were "on to something" and agreed that laughter itself could contribute to generating innovative ideas.

According to Marjanovic-Shane, Connery, and John-Steiner (2010), the manner in which learning environments are organized fosters or dissuades the emotional and relational conditions for creativity. Positive relationships fuel risk-taking and creative engagement, resulting in novel insights and achievements for all the members of a teaching-learning community. When group members felt supported and safe, they seemed to relax around each other despite any tensions due to their different standpoints. Findings from our study also showed how the group members supported each other when someone dared to suggest something really radical and referred to it as "wild". This support can be understood as a form of emotional scaffolding (John-Steiner, 2000, p. 128) that included the sharing of risks in the presentation of new ideas. The group members created a safety zone in which challenging each other and also being critical or disagreeing were tolerated and were treated as constructive.

In long-term relationships between partners who work and live together, a great degree of emotional appropriation can take place (John-Steiner, 2000). John-Steiner claims that genuinely caring is especially important in high anxiety activities. Indeed, in the groups that comprise experts working with other experts and being selected to participate in innovative idea generation, group members tend to worry about not being creative enough or about saying something "wrong". Being recognized as experts implied that they were used to having control over certain subjects so it was difficult for them to leave their comfort zone and discuss ideas about which they had little previous knowledge. This anxiety was often explicitly mentioned during meetings and, for example, many of them hesitated to be the first to draw on the smartboard. Also, this nervousness seemed to be a barrier for imagining all kinds of possibilities, with no limitations, and for "being creative". This was clearly worrying for the group members and particularly evident when new people were brought into the groups. In those moments, group members became a bit self-aware and careful as they didn't know the newcomers. Newcomers, too, seemed equally careful and reluctant. It was crucial in such situations to have respect for each other and recognize each other as resources in the group. It took some time to reach to a point where the new group members acted "freely" and began suggesting ideas outside the existing paradigms.

The combination of a supportive and challenging environment has been emphasized by many researchers as an important condition for creativity (Amabile et al., 1996; Anderson & West, 1998; Ekvall, 1996; Mathisen & Einarsen, 2004; Siegel & Kaemmerer, 1978; West & Richards, 1999). Amabile et al. (1996) argued that the creative climate consists of challenge, freedom, and support; in addition, it encourages openness and the tolerance of uncertainty. Our findings showed that, as the members of the group got to know each other, they trusted each other and achieved an emotional fine-tuning that helped to establish supportive relationships. This also helped them to be secure enough to challenge each other, as previously discussed.

Mahn and John-Steiner (2002, p. 5–6), claimed that joint activities are enhanced when the interactions between participants are supported by "the gift of confidence". In this reciprocal emotional support offered by partners in collaboration – whether they are novice learners of a new language or individuals engaged in the novel, creative endeavors – there is a dynamic interplay between their interactions and the ways in which they offer emotional support.

In the three groups careful listening, intense dialogue, and emotional support sustained the cooperative construction of understanding. In this way, emotion became a condition of possibility for the polyphonic imagination to emerge.

Polyphonic imagination

When summing up the characteristics of the creative processes presented in the discussion above, we return to the concept of *Polyphonic Imagination*. The groups' many voices and different perspectives can be conceptualized as a polyphony which stimulated the group members' imagination and in which everybody's voice was acknowledged. Polyphonic Imagination is, in other words, *a relational and multivoiced stimulation of fantasy*. The concept is derived from the processes between the group members using mediating tools, including technology, when co-constructing ideas. It is a collaborative, supportive, and creative act with an emphasis on the different voices and perspectives distributed among the group members.

The resulting model (see Figure 2) depicts how the multidisciplinary groups start from *diverse knowledge and experiences*. *Polyphony* exists both at the level of

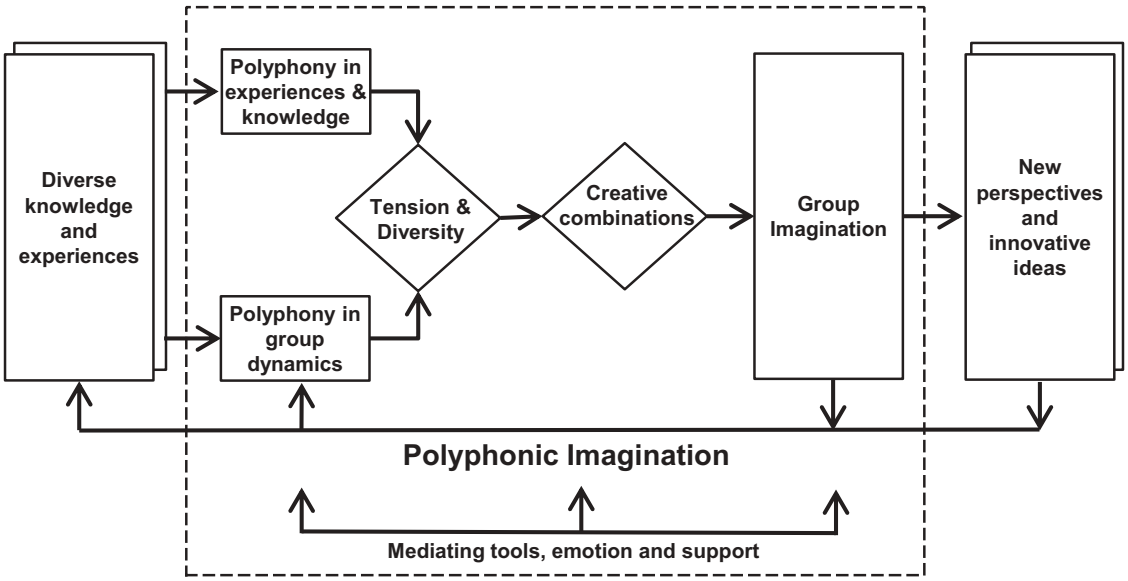

Figure 2. Polyphonic imagination.

experiences/knowledge, as well as in the *group dynamics*. This polyphony stimulates the *groups' imagination* through *tension and diversity* leading to *creative combinations* of existing knowledge. The polyphony and group imagination were aided by *mediating tools, emotions*, and by *how the group members supported* each other. This multivoiced and supportive stimulation of fantasy, *Polyphonic Imagination*, was enabled in group creative processes. Such polyphonic imagination resulted in *new perspectives and innovative ideas*. The concept of *Polyphonic Imagination* is thus supported by empirical data and, especially, by the sociocultural lens that guided the interpretation of these data.

In particular, Bakhtin's dialogic polyphony focuses on how new knowledge is created in the tension between voices and openness to other views. It stands in contrast to a monologic position (Morson & Emerson, 1990). Thus, polyphony is an apt analytical tool to use in order to describe how imagination operates in the co-construction of innovative ideas by multidisciplinary groups. The polyphony among the group members was fueled by a variety of shared experiences and perspectives, visualized and shared in the groups with the help of technological tools. As mentioned before, a Vygotskian view on imagination (John-Steiner, 2000; Vygotsky, 1930/2004) postulates that many voices co-construct knowledge together in supportive collaboration. Thus, this concept on polyphonic imagination is useful to highlight the importance of a wide experience base, tensions, and complementarity, and the affective and supportive aspects of the imagination behind creative knowledge processes. We suggest that such *Polyphonic Imagination* is what most deeply and basically characterized the creative knowledge processes in the groups that were observed in the study.

Concluding remarks

The paper proposes *Polyphonic Imagination* as a concept that captures the characteristics of creative processes and the multivoiced stimulation of fantasy in multidisciplinary groups. The paper goes against the traditional view on creativity as an individual trait (Amabile, 1996, 2008; Barron & Harrington, 1981; Feist, 1998). Our findings also differ from those social views on creativity (Diehl & Stroebe, 1991; Paulus, 2000; Paulus et al., 1995) that see the "social" as a simple variable among others. Instead, our findings indicate that the dynamics between the social and the individual is important. This is in line with a more research promoted by Vera John-Steiner and Keith Sawyer, among others, who consider the "social" as including the dynamic relation between self and others (Glăveanu, 2010). As Moran and John-Steiner (2003) suggested, collaborators are not homogeneous people, but rather individuals with different perspectives, expertise, conceptualizations, working methods, temperaments, resources, needs, and talents. The interactions between these differences in the three groups studied here formed the foundation on which dynamic forms of collaboration and creativity could unfold.

Note

1. All names used in the paper are pseudonyms.

Disclosure statement

No potential conflict of interest was reported by the authors.

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