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# Dialogism

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**Abstract:** Dialogism offers a theoretical framework for understanding Computer-Supported Collaborative Learning (CSCL). This framework begins with Mikhail Bakhtin's claim that meaning making requires the interanimation of more than one 'voice' as in polyphonic music. Dialogism offers an approach that leads to understanding through the juxtaposition of multiple perspectives. As well as having implications for how we research CSCL, dialogism also has implications for how we conceptualise the goal of CSCL, suggesting the aim of deepening and widening dialogic space. This chapter reviews research within a dialogic CSCL frame, offers a cutting-edge example, and presents predictions and suggestions for the future of dialogism within CSCL.

**Keywords:** dialogism; dialogic education; dialogue; dialogic; cscl; educational technology; edtech; digital technology, polyphonic model

## Definitions & Scope

Communication is central to CSCL. Therefore, any approach for analysing collaboration in this context needs to draw on, explicitly or implicitly, a philosophical view of language. Dialogism is one such perspective. It was introduced by Mikhail Bakhtin in the mid-20th Century (Bakhtin, 1984), and has had a significant influence on fields including philosophy (Clark and Holquist, 1984), education (Matusov, 2007), linguistics (Ducrot, 2001; Nølke, 2017), sociology (Markova, 2003), psychology (Shotter, 1995) and cultural studies (Wertsch, 1993). It considers that everything in life is "*dialogue, that is, dialogic opposition*" (Bakhtin 1984, p. 42) and how "*in dialogism there is always more than one meaning ... it places so much stress on connections between differences*" (Holquist, 1990, p.40). This emphasis on differences, in addition to the interanimation of 'voices', is fundamental for a dialogic understanding of meaning making by CSCL researchers.

Bakhtin developed his understanding of dialogism through considering the dialogue between and within texts, in particular the dialogue between characters within Dostoevsky's novels (Bakhtin, 1984). For Bakhtin, however, dialogism characterizes many aspects of our lives, for instance, polyphonic music, which is based on contrapuntal ("note counter note") relationships among interanimating voices: *"contrapuntal relationships in music are only a musical variety of the more broadly understood concept of dialogic relationships."* (Bakhtin 1984, p. 42)

Bakhtin's dialogism is also considered an important theoretical framework for understanding collaborative learning (Koschmann, 1999; Stahl, 2006; Trausan-Matu, 2010; Wegerif, 2007). In the context of research in CSCL specifically, dialogism may be viewed as a lens for examining collaborative learning among the other existing lenses. However, comparatively to the other lenses, the dialogic lens should be at least 'bifocal': *"one must be careful to discriminate between its use as a lens for close-up work and its ability to serve as an optic for seeing at a distance"* (Holquist, p.110). This is similar to the analysis of polyphonic music, which requires following each voice individually while, at the same time, following its contribution to the musical piece as a whole. In general, and in CSCL in particular, 'voices' can be conceptualised, in addition as belonging to participants, to represent ideas, perspectives and attitudes (Trausan-Matu, 2010), which interanimate.

The term dialogic is sometimes used quite loosely in education in a way that makes it seem to be almost synonymous with collaborative learning. We prefer to use dialogic as a technical term referring to the theory of dialogism which, as quoted above, claims that understanding is dialogic, thus, meaning making requires the interanimation of more than one 'voice' (where the term 'voice' is understood in the extended generalized sense referred to previously). Such a conceptualization complements other positions in the CSCL field, including trialogical learning and object-oriented collaboration (Paavola & Hakkarainen, this volume) and metacognition (Järvelä, Malmberg, Sobocinski, and Kirschner, this volume)

Dialogism offers a challenge to the use of those methods and methodologies for researching CSCL that are monologic in essence. Monologism as a methodological principle seeks to find a single correct viewpoint or 'true' perspective. This motivation can seem very useful in practice but, according to dialogic theory, the assumption that there can be only one single true perspective is an illusion. Where there is meaning there is necessarily more than one perspective. One way to make sense of this claim is to understand that for dialogism the meaning of anything is an answer to a question which we are asking either explicitly or implicitly, and questions are always asked within dialogues within contexts. The sign on the wall that says 'No Smoking' implies that someone might be thinking about smoking. To understand it we need to understand that context. The same is true of any claims made in research. Claims to truth are answers to questions raised within shared inquiry. To understand them, we need to understand those questions and the different voices that are in play. Dialogism, therefore, in contrast to monologism, supports a view of research as offering understanding through the juxtaposition and interanimation of multiple 'voices' with a view to informing educational design.

To claim that something is dialogic implies that to understand it is to participate in a dialogue in which at least two, probably more, voices, are in play together. Similarly to polyphonic music,

voices may have different features and play different 'tunes' (e.g. different ideas), have equal importance (one not being dominant), and enter in a sequence of divergences followed by convergences, on both transverse and longitudinal dimensions (Trausan-Matu, 2010, 2013). This resulting fabric is similar to creative conversations (e.g. brainstorming), the polyphonic model being a lens for analysing creativity in (and also designing) CSCL sessions.

Further, to claim that education is dialogic implies not only that it is taught through dialogue, but that it aims at dialogue: that it is education *for* dialogue as well as education *through* dialogue (Wegerif, 2019). For an individual learner this means becoming more dialogic, open to engaging with and learning through others and through otherness, better at asking good questions and holding multiple perspectives together in creative tension. At a more collective level of analysis, education for dialogue is about inducting students to participate in larger cultural dialogues in a way that, at the same time, expands and deepens those dialogues.

The significance of dialogic theory or dialogism to CSCL research has been noted (e.g. Koschmann, 1999; Stahl, Cress, Ludvigsen & Law, 2014). Defined through reference to the interanimation of voices, dialogism is useful as a contrast to other competing paradigms or theoretical frameworks in the field of CSCL. Where much CSCL discourse relies on the metaphor of construction, dialogism uses the foundational metaphor of meaning as a 'spark'

across difference. As Voloshinov <sup>[1]</sup> comments, meaning "*is like an electric spark that occurs only when two different terminals are hooked together*" (Voloshinov, 1973, p.103). This leads to the idea of a productive dialogue as a polyphony, in which several voices contribute in different ways to an overall meaning. Although much literature in the field of collaborative learning claims to value differences, metaphors such as 'finding common ground' and 'co-constructing knowledge' indicate a possible underlying assumption of an ontology of identity or the idea that ultimately meaning is grounded in definable 'things'. For dialogism, difference is fundamental to meaning such that dissonances (divergences) are the 'sparks' toward creative discourse construction. This underlying ontology of difference distinguishes dialogism as a paradigm within CSCL even when the practical outcomes of dialogism look similar to social-constructivism (Wegerif, 2007, Chapter 3).

Exposing the tension between dialogism and monologism should not be read as dismissing the monologic side of the argument. This is not a 'yes/no' or 'true/false' binary. To be consistent with dialogic theory, we have to acknowledge that the meaning and value of dialogism itself depends upon its difference from monologism. The difference between monologism and dialogism should, therefore, rather be read as a potential polyphonic weaving of multiple voices. This includes 'dialogic' voices in constructive, if sometimes challenging, tension with more 'monologic' voices. Our polyphony approach to diversity within CSCL is different from the common multiple lens approach as, for us, the voices in play are not just about epistemology or different ways in which we look at a single reality but they are also about ontology or different ways of understanding the nature of the reality that we are looking at.

# Unpacking Dialogism

Starting with the claim that the meaning of any utterance (or 'meaning unit') is given by its position and role within a dialogue, one way in which dialogism in education can be understood is as offering a theory of meaning. Meaning is not fixed, as it depends both on previous utterances (that are being responded to) and future utterances (that are in some way anticipated) (Rommetsveit, 1992; Linell, 2009). In this way, meaning can be conceptualised as always requiring a debate among several 'voices', each 'voice' keeping its particularities, including divergent positions, in addition to the coordination ('getting in sync') with the others (Gee, 2013). Meaning and creative thinking are built not only by coordination, but also by divergences in a polyphonic weaving of 'voices' (Trausan-Matu, 2010).

Through the 'interanimation' of different voices (Bakhtin, 1981), dialogism puts the methodological emphasis on the process of the emergence of meaning in the gap between voices sometimes also referred to as 'dialogic space' (Wegerif, 2019; Lambirth & all, 2016). This considers that the meanings of words, signs, people, technology and so on are not understood as fixed, but rather as emerging within dialogue and within dialogic space.

Knowledge is not understood as fixed or based on 'facts'. Instead, it is considered to emerge through dialogue. Importantly, what is meant by dialogue is interpreted in an extended sense. As Linell brings out (Linell, 2009) there is always a 'double dialogicality' in which utterances in any dialogue need to be understood, not only in their situation, but also as part of a longer-term dialogue with their situation, culturally and historically defined. Thus, in addition to dialogues between situated and physically embodied human voices, an understanding of dialogism extends to also include 'voices' conceived as aspects of the larger social context (Wegerif, 2019), or as distinct positions, ideas or threads of reasoning (Trausan-Matu, 2010). For example, an online computer-supported dialogue about mathematics between two nine-year old students might invoke and engage with the 'voice' of mathematics as a discipline.

Related to this is an understanding of dialogism as engaging learners in the longer-term dialogues of culture. There is always 'intertextuality' between dialogues so it is appropriate that these long-term dialogues of culture, the dialogue of history, for example, can also be sometimes referred to collectively as the dialogue of humanity or the 'conversation of mankind' (Oakeshott, 1959). Computer technology is often used as a means of linking students' everyday ideas, or the spontaneous and often situated way in which things are understood, with more technical concepts belonging to the long-term cultural dialogue. Dialogues around micro-worlds in science, for instance, allow students to test and develop their understandings leading them from everyday understandings of concepts like force, to the understandings of these concepts that are held in the relevant expert communities of practice (e.g. Roschelle & Teasley, 1995). This approach is common to CSCL, but what makes it more distinctively dialogic is the goal in education of teaching for dialogue as an end in itself. A focus on transmitting knowledge is replaced with the idea that we are teaching students 'the dialogue so far' in any area with a view to them joining that dialogue as active participants. All knowledge is taught as questionable, and the business of questioning and constructing knowledge is also taught.

An approach to dialogic education as induction into the long-term dialogues of culture perhaps has some overlap with social constructivism; the idea that knowledge is socially constructed and one aim of education is to draw students into the process of social knowledge construction through building 'knowledge objects' together (Bereiter, 2005: Paavola and Hakkarainen, this volume). One difference from social constructivism, however, is that for dialogism there is a reduced emphasis on the importance of constructing 'knowledge' when this is understood as taking an objective or material form. Instead, the primary focus is on developing the quality of dialogue. Dialogism is not just about the construction of new knowledge but views drawing learners into dialogue with voices from the past as a key function of education and, indeed, is part of helping learners to find their own voice. Implicitly, this involves learners participating in a dialogue with absent cultural voices.

The ideas of drawing learners into dialogue with voices from the past and the 'intertextuality' between dialogues are in consonance with the work of Russian scholar Mikhail Bakhtin (1895-1975), commonly associated with the ideas of multivocality, dialogism, and polyphony. However, he did not directly apply his insights to the field of education. In addition to being relevant for understanding dialogism as a theory of meaning, it is also worth noting that Bakhtin's ideas are applicable to an understanding of dialogism as ontology (Markova, 2003; Sidorkin, 1999). This ontological perspective (i.e. the study of being or what is really there) suggests dialogism is about more than the use of dialogue as 'a tool' for knowledge construction. Rather, it focuses on dialogue itself as an end in education, perhaps the most important end. This is a distinctive contribution of dialogism to the field of CSCL.

## Dialogism in the context of CSCL

Dialogism and its polyphonic model are powerful 'multifocal' lenses for CSCL research as they enable an examination of how discourse threads in CSCL conversations weave together. There is little doubt that contexts of CSCL, with their technologically mediated forms of discourse and interaction, provide new forms of discussion and offer innovative access for exploring dialogue (Stahl et al., 2014). For example, only in CSCL chat sessions, in contrast with face-to-face conversations, multiple threads of discussion may occur in parallel, giving birth to a polyphony of voices (Trausan-Matu, 2010).

Not all collaborative processes are, however, necessarily dialogic. They may be monologic in essence, driven by only one voice, the others only being its accompaniment (like in monophonic or homophonic music), without divergences, without a debate between independent voices (like in polyphonic music). CSCL is concerned with interactions between learners, specifically collaboration and communication. In this context, it is perhaps unsurprising that 'dialogue' may be observed to appear quite often and, therefore, be referred to in the day-to-day language sense as 'dialogic'. This is, however, a superficial interpretation and 'real' dialogue involves much more. It is possible for learners to collaborate to achieve a joint task, including contributing to the process of knowledge construction, without interanimation, without entering into dialogue. A 'real' dialogue, on the other hand, implies divergences, negotiations and debates among different points of view, and is as creative as it is critical.

In the age of our global 'Network Society' (Castells, 2004), the Internet along with the affordances of digital technology for supporting interaction highlight the relevance of dialogism for education. 'Cyberspace' is an imaginary, but nonetheless real world, where the frontiers are blurred and the 'other' exists through the inference of communication (Breton 2003). Or, conceived another way, cyberspace is a dialogic space supporting the interplay of potentially billions of 'voices'. Wikipedia [\[1\]](#) is one example of a new possibility for peer-to-peer knowledge construction where there are always multiple voices in play and no ultimate certainty or master narrative. Multiple voices 'interanimate' also, obviously, in instant messenger (chat) conversations, forum discussions, microblogs, etc, in a dialogue of participants as well as of ideas. The affordances of CSCL for learning may, thus, be extended to support dialogue not only between physically situated addressees but cultural or contextual 'voices' also.

Dialogism may be seen as a 'multifocal' lens, which allows to look at the same time both locally, at each voice, and at the coherent whole, as a musicologist analyses a polyphonic piece. Other lenses used in CSCL research focus mainly locally, for identifying and classifying utterances (Chiu, 2013), uptake acts (Suthers & Desiato, 2012), adjacency pairs (Stahl, 2006) or transacts (Gweon et al., 2013), and only then going to a 'global' level by making statistics or identifying patterns, including via machine learning methods. Transacts, uptakes, adjacency pairs, and argumentation analysis (Kimmerle, Fischer, and Cress, this volume) consider how pairs of utterances contribute to the dialog that construct knowledge. A further method, Social Network Analysis, computes statistics over the number of replies, connections or other relations between various items. Such lenses provide important data for analysing CSCL sessions. In some cases, for example, transacts, lenses tend to be 'bifocal'. In addition, dialogism looks in parallel to local and global levels through a 'multifocal' lens, considering how at least two voices (ideas) interanimate in long sequences of divergent and convergent pairs of utterances and may give birth to new ideas (Trausan-Matu, 2013), in a knowledge creation process (Scardamalia and Bereiter, Knowledge building, Advancing the State of Community Knowledge, this volume).

## History & Development

### Theoretical underpinnings

Dialogic education has deep roots in oral education traditions. The Ancient Greek philosopher Socrates, essentially an oral thinker who taught through dialogue, is often credited as being the originator of dialogic education. Some principles of dialogic education are referred to in ancient Indian texts and even feature on the pillars of Asoka that date back to the 4th century BCE (Sen, 2005). Halaqah, the idea of forming circles of learning, is a traditional Islamic approach to education that continues to be used to this day (Ahmed, 2014). Martin Buber outlined the distinction between an objectifying stance, which he called 'I-It', and a subjectifying or dialogic stance which he called 'I-Thou' (Buber, 1958). Buber's idea of "das Zwischen" or the "space of the 'in-between'" that is entered into in dialogue (Buber, 1958) is foundational for the theory of dialogic space introduced previously. Paulo Freire was the first to explicitly articulate a dialogic

theory of education in the context of what he called a 'pedagogy of the oppressed' (Freire, 1968/2018). Freire's concern was with an education which empowered learners to speak for themselves and to be able to name their own world. However, the writings of Bakhtin have been particularly influential for the recent interest in dialogism in CSCL. Bakhtin's analysis of dialogism is more philosophical and literary than educational, often based on the way in which texts enter into 'dialogic' relations (Bakhtin, 1986): "Truth is not born nor is it to be found inside the head of an individual person, it is born between people collectively searching for truth, in the process of their dialogic interaction" (Bakhtin, 1984, p.110).

Vygotsky's model of mediation, drawn from Marx's account of the use of tools as mediated physical forces acting on objects in the world, is also relevant to the recent development of dialogism in CSCL (Vygotsky, 1978, p.54). While Vygotsky did not directly coordinate his interests in talk and social interaction into an explicit focus on dialogue (Howe & Abedin, 2013), he argued how the acquisition and use of language plays an important role in developing learners' thinking. According to Vygotsky, thinking is a mediated and internalized form of self-talk, a dialogue with oneself (Stahl et al., 2014). He describes language as both a cultural tool (for the development and sharing of knowledge amongst members of a community or society) and as a psychological tool (for structuring the processes and content of individual thought), proposing that there is a close relationship between these two kinds of use, which can be summed up in the claim that 'intermental' (social, interactional) activity forges some of the most important 'intra-mental' (individual, cognitive) capabilities (Mercer, Hennessy & Warwick, 2017).

Vygotsky's (1986) idea of the *zone of proximal development* (ZPD) in particular, where learners are drawn beyond their current understanding by working with a teacher, adult or more competent peer (Kazak, Wegerif & Fujita, 2015), is one that brings the idea of dialogic relations into education. In the ZPD, the teacher has to engage with the perspective of the student (and vice-versa) in order to connect the development of ideas in the student to the pre-existing culture (Vygotsky, 1986). This also relates to an understanding of dialogism as drawing learners into dialogue with the voices from the past, as well as with the current global dialogue of humanity on the Internet, in order to help them find their own voice. This is because even as an individual act, the use of language in thought, speech or writing retains the dialogical character of all language as a historically evolved and culturally established medium of communication among people (Stahl et al., 2014). Referring to mathematics, this is an idea Sfard (2007) considers when she states:

... mathematical discourse learned in school is a modification of children's everyday discourses, learning mathematics may be seen as transforming these spontaneously learned colloquial discourses rather than as building new ones from scratch (Sfard, 2007, p.575).

While it is fair to say that dialogism emerged under the umbrella of the socio-cultural tradition (Koschmann, 1996; 1999), there is also a strong argument that dialogism can be viewed as a separate paradigm in its own right. The distinction between the two can be brought out through considering the idea of situated learning that is often used to define socio-cultural approaches. While on the one hand dialogues are situated in an empirical sense (i.e. occurring at a certain



time, in a certain place, between particular individuals), on the other how we understand our situation depends on dialogues in which acts of situating ourselves have to occur. This points to the more original reality of dialogic space as an underlying space of creativity opened up in dialogues; a space within which ideas of space, time, history, self and other are formed and can be unformed. There is therefore always also something unsituated in dialogues explaining their infinite potential for creativity (Wegerif 2006). The focus on the social and historical situatedness of cognition and learning that defines the socio-cultural paradigm tends to limit its capacity to offer a full theory of education. The unsituated-situatedness of dialogism enables it to offer a theory of education that is appropriate for the Internet Age. Dialogues on the Internet are not situated in a conventional way. Communication on the Internet can offer a partial instantiation of dialogue with an unbounded horizon. The dialogic theory of education that fits the needs of the Internet Age is the idea of education as the expansion and deepening of dialogic space pulled outwards by the call of the 'Infinite Other' (Wegerif, 2013). This theory links education to the more political sounding aim of 'global democracy' (Wegerif, 2017).

## Contemporary developments

Even a cursory analysis of the titles and abstracts of the articles published in the International Journal of Computer-Supported Collaborative Learning (ijCSCL) reveals how an interest in dialogism has been a key focus over the past decade. Work in this one venue alone has considered dialogism in a range of ways and at varying analytical 'levels'. Examples include research investigating how a dialogic stance can provide insights into how institutional practices shape the meanings and functions of CSCL tools (Arnseth & Ludvigsen, 2006); a dialogic approach for examining interaction, and how this can help in the design of effective pedagogical approaches related to the use of wikis in education (Pifarré & Kleine Staarman, 2011); how dialogical positions can be used to understand identity trajectories in a collaborative blended university course (Ligorio, Loperfido & Sansone, 2013); and, how CSCL affordances and dialogic learning can engage disengaged students (Slakmon & Schwarz, 2014).

A scoping review of the literature from the year 2000 onwards focusing on the use of technology in supporting dialogue provides insights into the ways digital tools can support, extend and transform dialogue and interaction in the classroom in particular (Major, Warwick, Rasmussen,

Ludvigsen & Cook, 2018). This review identified 72 studies <sup>[S]</sup> published since 2000 across 18 countries, including both small and larger scale analyses. Technology investigated included Computer-Mediated Communication tools, Interactive Whiteboards, subject-specific learning tools, mobile 'apps', tablet computers, blogging/microblogging tools, wikis and touch table technology. Three overarching themes, each with several subthemes, were identified. First, **'dialogue activity'** - featuring alternative perspectives (both exposure to and taking into account others' views); knowledge co-construction; using dialogue to express meta-cognitive learning; and using dialogue to scaffold understanding. The more holistic theme of **'learning environment'** - featuring learner autonomy; learner inclusion & participation; classroom atmosphere; interpersonal relationships; motivation and engagement. A final third theme of **'technological affordances'** - featuring creation of a shared dialogic space; mediating

interaction; externalisation of ideas; informing teaching; multimodality; pace; provisionality; representation of content; temporal factors.

While focusing on research undertaken in classrooms, this scoping review provides a useful framing device for reviewing new developments relating to the analysis of dialogism and technology more broadly in other contexts. And in addition to demonstrating how there is global interest in combining dialogic educational approaches and digital technology, it highlights how affordance, interdependency and dialogue itself appear to be key concepts that frame the social situation in which students build knowledge and meaning with and through digital tools.

## State of the art: Analysing and designing for dialogism

In this section, we examine how the dialogic perspective of CSCL inspired from Bakhtin's polyphony theory (Bakhtin, 1984) is an appropriate paradigm for analysing the phenomena appearing in discourse building in collaborative learning (Koschmann, 1999; Stahl, 2006; Trausan-Matu, 2010). We do this by considering the example of the polyphonic model and the associated, computer-supported, analysis method.

### The polyphonic model and the associated, computer-supported, analysis method

#### Introducing the polyphonic model

As previously outlined, dialogic knowledge construction in CSCL conversations is a process that implies interanimation of several voices, in a generalized sense (Trausan-Matu, 2010). It is a source of what Chiu calls micro-creativity (Chiu, 2013), or knowledge building (Scardamalia and Bereiter, Knowledge building, Advancing the State of Community Knowledge, this volume) for instance, in the case of learners collaboratively rebuilding mathematical proofs in small groups. Like any creative process, it needs sequences of divergences and convergences (Csikszentmihalyi, 1996) among different, dialogic positions, reflecting concepts and ideas, which should interanimate, eventually generating a coherent discourse. Such a weaving is characteristic also to polyphonic music, which, in fact, reveals a fundamental feature of human beings (Bakhtin, 1984; Pesic, 2017), whom are able to cope with more than one voice (in the generalized sense considered in this text) at the same time (Pestic, 2017). The sequence of passing dissonances/divergences, that induce tension, resolved by consonances/convergences according to contrapuntal relations reflect a general feature of our life: the trend for both variation (novelty, avoiding monotony) and unity, what Bakhtin compared to the centrifugal and centripetal forces from physics (Bakhtin, 2001). Repetition and rhythm, essential musical features, are also very important for enabling involvement in conversations

(Tannen, 2007), with even neurological data proving the importance of these factors in human language (Sacks, 2007; Levitin, 2006).

Bakhtin characterizes polyphony, as “*different voices singing variously on a single theme [...]* exposing the diversity of life and the great complexity of human experience” (Bakhtin, 1984, p. 42; italics belong to the author). Quoting Glinka, he also emphasizes how: “*Everything in life is counterpoint, that is, opposition*” (Bakhtin, 1984, p. 42; italics belong to the author). Contrapuntal relationships in polyphonic music assure divergence/opposition/dialogism among two or more separate tunes (voices) that are played or sung at the same time, while however, achieving a coherent whole. They “are only a musical variety of the more broadly understood concept of dialogic relationships” (Bakhtin, 1984, p. 42). Polyphony can be viewed as the merging of the longitudinal, sequential dimension of voices’ development and of the transversal one, that is, the co-occurrence of voices (Trausan-Matu, 2010).

Starting from the above considerations, polyphony appears to be particularly well suited for modelling collaborative knowledge construction in small groups. This is because collaborative learning naturally involves participants with multiple voices (in the generalized sense, ideas), which, in a polyphonic construction have the possibility to fully manifest their personalities, putting in value their particularities in order to construct knowledge, targeting CSCL success.

Similarly to polyphonic jazz music improvisation (Trausan-Matu, 2010) or novels (Bakhtin, 1984), the polyphonic model of discourse considers voices, in an extended sense, as threads of ideas, concepts, and even words that enter in dialogic relations. The different particularities of opposing voices/ideas generate divergences, inducing tension solved by convergences, according to interanimation patterns, the final result being a coherent and creative discourse. In many collaborations such a polyphonic weaving may be identified, not only in textual or verbal interaction but also in non-verbal cases, in gestures, for example, in classrooms (Trausan-Matu, 2013).

As an example of polyphonic weaving we present in the central part of Figure 1 a fragment of a CSCL chat session where students had to debate about the requirements for an interactive computer application (the thin curly arrows on the left are important references between utterances, explicitly indicated by learners using a facility of the chat environment [Holmer, Kienle, and Wessner, 2006] - the number of the referenced utterance is in the ‘Ref’ column - and the straight lines are repetitions of words that become voices). The process of knowledge construction involves several threads of concepts (‘topic’, ‘presentation’, ‘reply’), which behave like voices that interanimate through divergences and convergences. For example, in the beginning of the chat the participants identify several divergences among the three concept-voices (linking utterances Nr. 18, 23, 27 and 30): They find the reply method cumbersome, they do not like that replies are linearly represented and how topics are presented. As a resolution, convergences appear at utterances Nr. 24, 27 and 28. A very important one is at Nr. 28, proposing “a tree presentation” for replies, several other convergences continuing it. However, the ‘but’ discourse marker at utterance Nr. 30 (surrounded by a diamond in Figure 1) clearly indicates another divergence, now between the ‘reply’ and ‘topic’ voices. This divergence is

also resolved by a convergence with the 'representation' voice ("You need also a clever visual representation"), as suggested by the 'also' discourse marker.

The interanimation of the three voices is illustrated from a different perspective on the right side of Figure 1. The sequence of divergences and convergences is similar to a creative process (Csikszentmihalyi, 1996), being a base for knowledge creation (Scardamalia and Bereiter, Knowledge building, Advancing the State of Community Knowledge, this volume) or to the consonances that resolute dissonances in music (Kolinski, 1962).

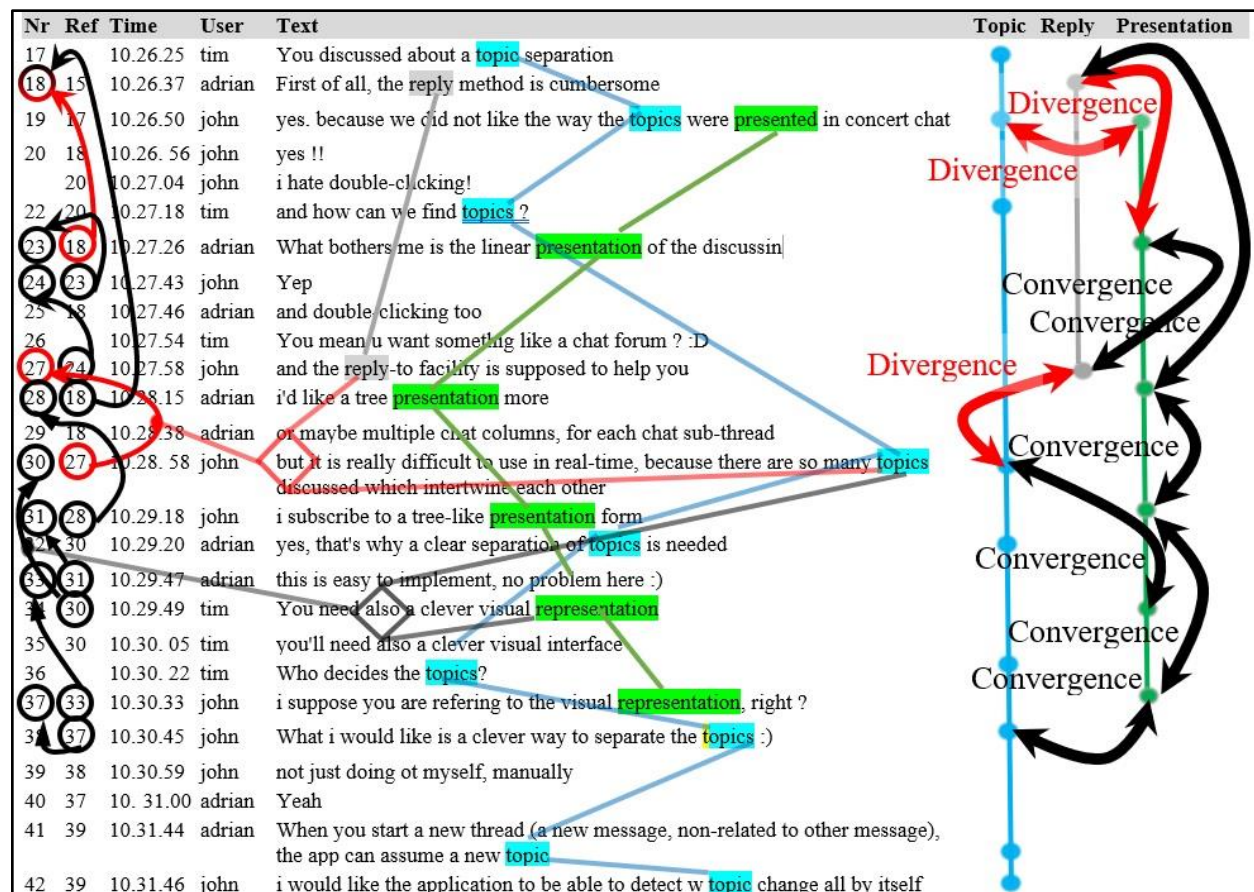


Figure 1. Interanimation of concepts in a CSCL chat.

Gee also uses a music-related image for socially-built discourse, that he names 'Discourse', with a capital 'D': "Being in a Discourse means being able to engage in a particular sort of 'dance' with other people, words, deeds, values, feelings, ..." (Gee, 2013). Gee's 'dance' Discourse might, at a first sight, be similar to the idea of a polyphonic improvisation, because it also involves different personalities that aim to achieve a joint goal. However, the majority of 'dances' need a synchronized participation, unexpected divergences/dissonances being not welcome. Gee considers that personalities should align to the social Discourse, while in polyphony discourse is constructed by personalities that manifest their differences, they have divergences, entering into debates. In the polyphonic model there is an equal emphasis on a

Discourse, as a whole, and voices, as individuals that are influenced by existing Discourses, sometimes divergent, but which jointly achieve new Discourses.

The relation between polyphony and dialogue, in general, may be understood better starting from Bakhtin's remark that "authentic polyphony [...] did not and could not have existed in the Socratic dialogue" (Bakhtin, 1984, p. 178), referring probably to the fact that in polyphony all participants (voices) should be with equal importance, there should not be an authoritarian, leading voice (like, for example, in some dances, where one of the two participants is the leader).

## The polyphonic analysis method

There are several approaches for the analysis of CSCL conversations. Some of them are done without computerised support using, for example, Conversation Analysis methods (Zemel, Xhafa, and Çakir, 2009). Others use in various types of software tools: for statistical analyses (Zemel, Xhafa, and Çakir, 2009) as well as Natural Language Processing or/and Social Networks Analysis (Rosé et al., 2008; Suthers & Desiato, 2012; Dong, 2005; Trausan-Matu et al., 2014).

The polyphonic analysis method of CSCL conversations is grounded on the polyphonic model, starting from the idea that voices may also be threads of concepts and ideas in dialogues, manifested by the repetition or by semantically related chains of words or phrases. The analysis method is aimed to reveal the collaboration process, considering fundamental features of dialogism: multivocality, divergences and convergences, interanimation, polyphony, authoritarian voices, chronotopes, and ventriloquism (Trausan-Matu, 2010; Trausan-Matu, Dascalu & Rebedea, 2014). The polyphonic analysis of CSCL conversations starts from "the profound dialogism of the word" (Bakhtin, 1984, p.292): "Dialogue is studied merely as a compositional form in the structuring of speech, but the internal dialogism of the word (which occurs in a monologic utterance as well as in a rejoinder), the dialogism that penetrates its entire structure, all its semantic and expressive layers, is almost entirely ignored" (Bakhtin, 1981, p.279).

The polyphonic analysis of CSCL conversations may be done manually (like in the example from Figure 1) or using computerized support (Natural Language Processing and Social Network Analysis), in a sequence of steps that involve delimitation of utterances, identification of the candidates for voices starting from the threads of main concepts occurring in utterances, and analysis of the interanimation among voices, starting from divergences and convergences (Trausan-Matu, Dascalu, and Rebedea, 2014). As a result of this polyphonic analysis, even a numerical measure of interanimation may be computed for characterising the collaboration, together with each learner's participation degree (Dascalu and all, 2015; Trausan-Matu and all, 2014). Several systems were implemented starting from this methodology. Among these, the most complex are PolyCAFe (Trausan-Matu, Dascalu & Rebedea, 2014), and ReaderBench (Dascalu et al., 2015).

Several other researchers started from Bakhtin's ideas in order to catch specific dialogism features in conversations, considering their tempos and chronotopes (Ligorio & Ritella, 2010) or repetition and rhythm (Tannen, 2007). However, we believe that a more complex analysis should consider the polyphonic weaving of discourse (Trausan-Matu, 2010), which, additionally, may also benefit from computer support (Trausan-Matu et al., 2014).

## Designing dialogic CSCL sessions

In order to enhance knowledge construction, CSCL chat sessions (or discussions on forums) may be designed and (if moderated) conducted for inducing dialogism (Stahl, 2009) and polyphony (Trausan-Matu, 2010). In this aim, for example, the imposed subject of CSCL chat sessions might be a debate among some concepts followed by constructing a solution, learners being instructed to enter in divergences followed by convergences. An excerpt from such a chat is shown in Figure 1. This approach was used at University Politehnica of Bucharest also in a more specific way: Students were told that each of them should support a technology presented at the course, taking the role of the representative of a company that sells that technology (thus, becoming a voice in the extended sense). They were encouraged to take divergent positions but eventually try to have convergent achievements (Trausan-Matu et al., 2014).

Dialogism views that the very reason new understanding emerges is due to the 'gap' or 'space' between different perspectives. Closely related to the idea of 'dialogic space' introduced previously, one of the main causal mechanisms of dialogic learning can be described as the 'switch' whereby a student is drawn to see or feel things from a new perspective. For participants in dialogue, the gap opens up into an experienced dialogic space within which various voices are in relationship and able to 'interanimate' each other. According to Bakhtin (1986), it is because of this gap that dialogue is possible in the first place.

Importantly, dialogic switches do not only occur with physically present voices and physically present tools but also with virtual cultural voices, for example the virtual voice of a 'generalised other' (Mead, 1934) or 'superaddressee' (Bakhtin, 1984) position which might be that of, for example, the point of the community of mathematicians (Kazak, Wegerif, & Fujita, 2015). The affordances of CSCL tools and supporting pedagogy can be 'engineered' to support and facilitate this process. For example, in the Metafora project, tools were designed to prompt students to take different perspectives with a series of 'hats' representing the attitudes appropriate for different stages in collaborative problem solving. Here, as often with the use of avatars, the design of online 'tools' became also the design of 'voices' (Yang et al, 2013)

The dialogic paradigm in CSCL generates the unique pedagogical aim of dialogue as an end in itself which translates as the idea that the aim of education might not be the construction of shared knowledge so much as the expansion of dialogic space. This is exemplified in a number of Internet-mediated education projects. Empatico<sup>\*\*\*</sup>, for example, is a platform offering links between schools around the world with an associated pedagogy designed to promote understanding and empathy across cultural diversity. It aims to reach children between the ages



of 7 and 11. Generation Global [\[11\]](#) is a similar project aimed more at young people aged 12 to 16 with the explicit aim of preventing violent extremism through promoting open-mindedness. As well as blogging, Generation Global supports internet-mediated video links between classes around the world with a particular focus on schools in countries that have some history of conflict. A recent evaluation of the impact of Generation Global over a one-year-period involving over 1000 participants found evidence of increased 'dialogic open-mindedness' (Wegerif et al 2017). This study developed a dialogic research methodology appropriate for the Internet combining an 'inside' perspective or phenomenology of experience gained through interviews and online ethnography with a more 'outside' measure. The aim of combining an inside view with an outside view here is not to reduce one to the other but to generate new insights and understanding through juxtaposing them in such a way that they interanimate and inter-illuminate each other. Following the dialogic theory of Merleau-Ponty, this methodology is called 'Chiasm' (Kershner, Hennessy, Wegerif and Ahmed, in press).

## The Future

Maybe one big challenge facing CSCL is to support the emergence of a planetary intelligence able to respond to the many global challenges humanity faces (Lévy and Bonnono, 1997). This implies a need to develop an entirely new theory and practice of education. Dialogism, and the dialogic theory of education for the Internet Age that stems from it, has the potential to address this challenge. Dialogic education is not just education for the already established educational ends; beyond these it is also education for encouraging creativity, a polyphony of voices, and unbounded dialogue, which prepares the conditions for a possible future dialogic democracy, i.e. a democracy which is not so much focussed on voting as on reaching understanding and, where possible, agreement, through dialogue.

The kind of educational projects required to take this forward include the support of dialogue as an end itself, exemplified above by the Empatico and Generation Global projects, but also more focussed projects supporting teams of students in classrooms around the world learning how to work together in responding to global challenges. Such projects require the Learning to Learn Together (L2L2) (Yang et al, 2013) and polyphonic approaches to pedagogy developed within dialogic theory and partly described above.

Artificial intelligent conversational agents, e.g. Apple Siri, are widely available today. Several such agents have been developed and have shown their potential as support for online dialogic teaching and learning, either replacing a real tutor or even trying to be participants in a CSCL chat (e.g. Tegos et al., 2016; Kumar and Rosé, 2011; Rus et al, 2013, Graeser et al, 2017; Wegerif & Major, 2018). This is likely to be a growing area of dialogic research in the future, supported also by the expected advances of Natural Language Processing. Potentially these agents could be enhanced if they were able to identify and generate divergences and to propose convergences in order to induce interanimation and polyphony.

Perhaps the biggest challenge that dialogism faces within the CSCL research community is that of misunderstanding. The assumptions of monologism are so ingrained in some scientific research traditions that it seems hard for many to appreciate the dialogic difference, the idea that meaning is never a 'thing' but always a spark across difference. Forms of design-based research - such as in some of the projects illustrated above as well as in the chapter by Kali and Hoadley (this volume) - offer a way to understand and conduct research in a way that is compatible with this dialogic insight. The aim of design-based research into effective educational dialogue 'online' is not to reduce the variety of voices in play to a single true representation. The aim of such research is to expand dialogic space, designing in ways that bring more voices into play and that improve the quality of the dialogue through bringing quite diverse perspectives into dialogically creative relationships. Another approach to CSCL research, which challenges the still dominant monologic tradition, is the Chiasm methodology described in the previous section. The idea here is to study online learning through juxtaposing two main perspectives or stances: the inside-out perspective of an interpretation of lived experience and the outside-in perspective of objective measures that attempt to locate and compare instances of learning. What makes this Chiasm approach applicable to researching dialogism is that there is no reduction of these two perspectives to a single representation but the recognition that understanding is always a creative act; a spark across difference.

## References

- Ahmed, F. (2014) Exploring halaqah as research method: a tentative approach to developing Islamic research principles within a critical 'indigenous' framework, *International Journal of Qualitative Studies in Education*, 27:5, 561-583.
- Arnseth, H. C., & Ludvigsen, S. (2006). Approaching institutional contexts: systemic versus dialogic research in CSCL. *International Journal of Computer-Supported Collaborative Learning*, 1(2), 167-185.
- Bakhtin, M.M. (1981). *The dialogic imagination: Four essays* (C. Emerson & M. Holquist, Trans.). Austin and London: The University of Texas Press.
- Bakhtin, M.M. (1984). *Problems of Dostoevsky's poetics* (C. Emerson, Trans. C. Emerson Ed.). Minneapolis: University of Minnesota Press.
- Bakhtin, M. (1986). *Speech genres and other late essays*. University of Texas Press.
- Bereiter, C. (2005). *Education and mind in the knowledge age*. Routledge.
- Buber, M. (1958). In: Smith RG (ed) *I and thou*. T & T Clark, Edinburgh (Translated by Smith RG).
- Castells, M. (2004). *The network society A cross-cultural perspective*. Edward Elgar.



Chiu, M. M. (2013). Social metacognition, micro-creativity and justifications: Statistical discourse analysis of a mathematics classroom conversation. In *Productive Multivocality in the Analysis of Collaborative Learning* (pp. 141-160). New York: Springer.

Clark, K., Holquist, M. (1984) Mikhail Bakhtin, Harvard University Press, 1984.

Csikszentmihalyi, M. (1996) *Creatlivity: flow and the psychology of discovery and invention*, Harper Collins.

Dascalu M., Trausan-Matu S., McNamara D.S., and Dessus, P. (2005) ReaderBench – Automated Evaluation of Collaboration based on Cohesion and Dialogism. *International Journal of Computer-Supported Collaborative Learning* 10, 4, pp. 395–423.

Dong, A. (2005) The latent semantic approach to studying design team communication. *Design Studies*, 26(5), 445–461.

Ducrot, O. (2001) "Quelques raisons de distinguer "locuteurs" et "énonciateurs" ", *Polyphonie – linguistique et littéraire*. Documents de travail, 3, 19-41.

Freire, P. (1968/2018). *Pedagogy of the oppressed*. Bloomsbury Publishing USA.

Gee, J.P. (2013) Discourse vs. discourse, in *The Encyclopedia of Applied Linguistics*, Willey-Blackwell

Gewon, G., Jain, M., McDonough, J., Raj, B., & Rosé, C. (2013) Measuring prevalence of other-oriented transactive contributions using an automated measure of speech-style accommodation. *IJCSSL* 8 (2), pp. 245-265

Graesser, A.C., Cai, Z., Morgan, B., & Wang, L. (2017). Assessment with computer agents that engage in conversational dialogues and trialogues with learners. *Comput. Hum. Behav.* 76, 607-616.

Hennessey, S. (2011). The role of digital artefacts on the interactive whiteboard in supporting classroom dialogue. *Journal of Computer Assisted Learning*, 27(6), 463-489.

Holquist, M. (1990), *Dialogism. Bakhtin and his World*, Routledge

Holmer, T., Kienle, A., & Wessner, M. (2006). Explicit Referencing in Learning Chats: Needs and Acceptance. In W. Nejdil & K. Tochtermann (Eds.), *First European Conference on Technology Enhanced Learning, EC-TEL 2006* (pp. 170– 184). Crete, Greece: Springer.

Järvelä, Malmberg, Sobocinski, and Kirschner, this volume

Kali and Hoadley (this volume)

Kershner, R., Hennessey, S., Wegerif, R., & Ahmed, A. (2020). *Research Methods for Educational Dialogue*. Bloomsbury Publishing.

Kimmerle, Fischer, and Cress, this volume

Kolinski, M. (1962). Consonance and Dissonance. *Ethnomusicology*, 6(2), 66-74.

Koschmann, T. (1999). Toward a Dialogic Theory of Learning: Bakhtin's Contribution to Learning in Settings of Collaboration. In Proceedings of the Computer Supported Collaborative Learning Conference, Palo Alto, Ca., pp. 308-313.

Koschmann T., (Ed.). (1996). CACL: Theory and practice of an emerging paradigm. Mahwah, NJ: Lawrence Erlbaum Associates.

Kumar, R. & Rosé, C.P. (2011) Architecture for Building Conversational Agents that Support Collaborative Learning. *IEEE Trans. Learn. Technol.* 4, 1, 21-34

Lambirth, A., Bruce, T., Clough, P., Nutbrown, C., & David, T. (2016). Dialogic space theory. In *The Routledge international handbook of philosophies and theories of early childhood education and care* (pp. 165-175). Routledge London.

Levitin, D. (2006) *This is your brain on music. The science of a human obsession*, Penguin Books Ltd., London.

Lévy, P., & Bononno, R. (1997). *Collective intelligence: Mankind's emerging world in cyberspace*. Perseus books.

Linell, P. (2009). Rethinking language, mind, and world dialogically. IAP.

Ligorio, M.B., Ritella, G. (2010). The collaborative construction of chronotopes during computer-supported collaborative professional tasks. *International Journal of Computer-Supported Collaborative Learning*, 5(4), 433–452.

Ligorio, M. B., Loperfido, F. F., & Sansone, N. (2013). Dialogical positions as a method of understanding identity trajectories in a collaborative blended university course. *International Journal of Computer-Supported Collaborative Learning*, 8(3), 351–367.

Ludvigsen, S., Cress, U., Rosé, C.P., Law, N., & Stahl, G. (2018) Developing understanding beyond the given knowledge and new methodologies for analyses in CACL *International Journal of Computer-Supported Collaborative Learning*, 13(4), 359-364.

Major, L., Warwick, P., Rasmussen, I., Ludvigsen, S., & Cook, V. (2018). Classroom dialogue and digital technologies: A scoping review. *Education and Information Technologies*, 23(5), 1995–2028. <https://doi.org/10.1007/s10639-018-9701-y>.

Markova, I. (2003) *Dialogicality and social representations: the dynamics of mind*, Cambridge University Press.

Matusov, E. (2007). Applying Bakhtin scholarship on discourse in education: A critical review essay. *Educational Theory*, 57(2), 215-237.

Mead, G. H. (1934/1962). *Mind, self and society*. Chicago: University of Chicago Press.

Mercer, N, Hennessy, S., & Warwick, P. T. (2017). *Dialogue, Thinking Together and Digital Technology in the Classroom: Some Educational Implications of a Continuing Line of Inquiry*. <https://doi.org/10.1016/j.ijer.2017.08.007>

Nølke, H. (2017) *Linguistic Polyphony. The Scandinavian Approach: ScaPoLine*. *Studies in Pragmatics*, 16, Leiden: Brill.

Oakeshott M (1959) *The voice of poetry in the conversation of mankind: an essay*. Bowes & Bowes, Cambridge.

Paavola & Hakkarainen, this volume

Pesic, P. (2017) *Polyphonic Minds. Music of the Hemispheres*, MIT Press.

Pifarré, M., & Kleine Staarman, J. (2011). Wiki-supported collaborative learning in primary education: How a dialogic space is created for thinking together. *International Journal of Computer-Supported Collaborative Learning*, 6(2), 187–205.

Rommetveit, R. (1992). Outlines of a dialogically based social-cognitive approach to human cognition and communication. In *The dialogical alternative: Towards a theory of language and mind*, (pp. 19-44). Oslo, Norway: Scandinavian University Press.

Roschelle, J., & Teasley, S. D. (1995). The construction of shared knowledge in collaborative problem solving. In *Computer supported collaborative learning* (pp. 69-97). Springer, Berlin, Heidelberg.

Rosé, C. P., Wang, Y. C., Cui, Y., Arguello, J., Stegmann, K., Weinberger, A., & Fischer, F. (2008). Analyzing collaborative learning processes automatically: Exploiting the advances of computational linguistics in computer-supported collaborative learning. *International Journal of Computer Supported Collaborative Learning*, 3(3), 237–271.

Rus, V., D'Mello, S., Hu, X., & Graesser, A. (2013). Recent Advances in Conversational Intelligent Tutoring Systems. *AI Magazine*, 34(3), 42-54.

Sacks, O. (2007). *Musicophilia: Tales of Music and the Brain*. New York, NY: Vintage Books.

Scardamalia and Bereiter, *Knowledge building, Advancing the State of Community Knowledge*, this volume

Sen, A. (2005). *The argumentative Indian: Writings on Indian history, culture and identity*. New York: Farrar, Straus & Giroux.

Sfard, A. (2007). When the rules of discourse change, but nobody tells you: Making sense of mathematics learning from a commognitive standpoint. *Journal of the Learning Sciences*, 16(4), 567–615.

Sfard, A. (2008). *Thinking as communicating: Human development, the growth of discourses and mathematizing*. Cambridge: Cambridge University Press.

Sidorkin, A. M. (1999) *Beyond discourse: education, the self and dialogue* (New York, State University of New York Press).

Slakmon, B., & Schwarz, B. B. (2014). Disengaged students and dialogic learning: the role of CSCL affordances. *International Journal of Computer-Supported Collaborative Learning*, 9(2), 157–183.

Shotter, J. (1995). Dialogical psychology. In J.A. Smith, R. Harre, & L. van Langenhove (Eds.), *Rethinking Psychology* (pp.160-178). London: Sage.

Stahl, G. (2006) *Group cognition: Computer support for building collaborative knowledge*. Cambridge, MA: MIT Press.

Stahl, G. (2009). *Studying Virtual Math Teams*. New York, NY: Springer.

Suthers, D., & Desiato, C. (2012). Exposing Chat Features Through Analysis of Uptake Between Contributions. In 45th Hawaii International Conference on System Sciences (pp. 3368–3377). Maui, HI: IEEE.

Tannen, D. (2007). *Talking voices: Repetition, Dialogue, and Imagery in Conversational Discourse* (2nd ed.). Cambridge, UK: Cambridge University Press.

Tegos, S., Demetriadis, S., Papadopoulos, P. M., & Weinberger, A. (2016). Conversational agents for academically productive talk: A comparison of directed and undirected agent interventions. *International Journal of Computer-Supported Collaborative Learning*, 11(4), 417-440.

Trausan-Matu, S. (2010). The Polyphonic Model of Hybrid and Collaborative Learning. In F. Wang, L., J. Fong. & R. C. Kwan (Eds.), *Handbook of Research on Hybrid Learning Models: Advanced Tools, Technologies, and Applications* (pp. 466–486). Hershey, NY: Information Science Publishing.

Trausan-Matu, S. (2013). Collaborative and Differential Utterances, Pivotal Moments, and Polyphony. In D. Suthers, K. Lund, C. P. Rosé, C. Teplovs & N. Law (Eds.), *Productive Multivocality in the Analysis of Group Interactions* (Vol. 15, Computer-Supported Collaborative Learning Series, pp. 123–139). New York, NY: Springer.

Trausan-Matu S., Dascalu M., Rebedea, T (2014) PolyCAFe—automatic support for the polyphonic analysis of CSCL chats, *International Journal of Computer-Supported Collaborative Learning*, Volume 9(2), Springer, pp. 127-156.

Voloshinov, V. N. (1973). *Marxism and the philosophy of language*. Seminar Press.

Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: MIT Press.

Vygotsky L. S. (1986). *Thought and language*. Cambridge, MA: MIT Press.

Wegerif, R. (2006). A dialogic understanding of the relationship between CSCL and teaching thinking skills. *International Journal of Computer-Supported Collaborative Learning*, 1(1), 143-157.

Wegerif, R. (2007). *Dialogic education and technology: Expanding the space of learning* (Vol. 7). Springer Science & Business Media.

Wegerif, R. (2013). *Dialogic: Education for the internet age*. Routledge.

Wegerif, R. (2017). Introduction. Education, Technology and Democracy: Can Internet-Mediated Education Prepare the Ground for a Future Global Democracy?. *Civitas educationis. Education, Politics, and Culture*, 6(1), 17-35.

Wegerif, R (2019). Dialogic Education. Oxford Encyclopedia of Research on Education.

Wegerif, R., Doney, J., Richards, A., Mansour, N., Larkin, S., & Jamison, I. (2017). Exploring the ontological dimension of dialogic education through an evaluation of the impact of Internet mediated dialogue across cultural difference. *Learning, Culture and Social Interaction*.

Wegerif, R., & Major, L. (2018). Buber, educational technology, and the expansion of dialogic space. *AI & SOCIETY*, 1-11.

Wertsch, J. (1993). *Voices of the Mind: A sociocultural approach to mediated action*. Cambridge: Harvard University Press.

Yang., Y., Wegerif, R., Dragon, T., Mavrikis, M., & McLaren, B. (2013). Learning how to learn together (L2L2): Developing tools to support an essential complex competence for the Internet Age. In *Proceedings of Computer Supported Collaborative Learning*, Madison, USA, 2013.

Zemel A., Xhafa F., Çakir M.P. (2009). Combining Coding and Conversation Analysis of VMT Chats. In: Stahl G. (eds) *Studying Virtual Math Teams*. Computer-Supported Collaborative Learning Series, vol 11. Springer, Boston, MA.

## Additional Reading

Koschmann, T. (1999). *Toward a dialogic theory of learning: Bakhtin's contribution to understanding learning in settings of collaboration*. In *Proceedings of the 1999 conference on Computer support for collaborative learning* (p. 38). International Society of the Learning Sciences.

The author of the paper proposes the dialogic theory of M. M. Bakhtin as a theoretical framework for Computer-Supported Collaborative Learning. Multivocality, polyphony, heteroglossia, and intertextuality, fundamental concepts of dialogism introduced by Bakhtin, are introduced and discussed as a basis for considering collaborative learning essentially based on dialog, seen as a third metaphor: learning by transaction, in addition to learning as acquisition and as participation.

*Stahl, G., Cress, U., Ludvigsen, S., & Law, N. (2014). Dialogic foundations of CSCL. International Journal of Computer-Supported Collaborative Learning, 9(2), 117-125.*

The paper introduces a special issue of the International Journal of Computer-Supported Collaborative Learning. It considers the dialogical perspective as an important theoretical framework for CSCL and it presents the roots and influences of this approach (the ideas of Vygotsky, Bakhtin, Dewey, and Mead). The four papers of the special issue are discussed and classified as belonging to two categories: The first two papers consider the group and the interactions among participants as subjects of analysis, and the next two focus on individual opinions, actions, and behaviours.

*Major, L., Warwick, P., Rasmussen, I., Ludvigsen, S., & Cook, V. (2018). Classroom dialogue and digital technologies: A scoping review. Education and Information Technologies, 23(5), 1995–2028.*

A scoping review of the literature from the 2000 onwards focusing on the use of technology in supporting classroom dialogue. It identifies 72 studies published since 2000 across 18 countries, including both small and larger scale analyses. Three overarching themes are identified, each consisting of a number of sub-themes. The review provides a useful framing device for reviewing new developments relating to the analysis of dialogue and technology.

*Wegerif, R. (2007). Dialogic education and technology: Expanding the space of learning (Vol. 7). Springer Science & Business Media.*

The program of research reported in this book reveals key characteristics of learning dialogues and demonstrates ways in which computers and networks can deepen, enrich and expand such dialogues. It develops a dialogic perspective by drawing upon work in communications theory, psychology, computer science and philosophy. This perspective foregrounds the creative space opened up by authentic dialogues. The central argument of the piece is that there is a convergence between this dialogic perspective in education and the affordances of new information and communications technology.

*Trausan-Matu, S. (2010). The Polyphonic Model of Hybrid and Collaborative Learning. In F. Wang, L., J. Fong. & R. C. Kwan (Eds.), Handbook of Research on Hybrid Learning Models: Advanced Tools, Technologies, and Applications (pp. 466–486). Hershey, NY: Information Science Publishing.*

The paper presents in detail the polyphonic model of discourse with emphasis on CSCL conversations, considering also blended (hybrid) learning. It discusses in detail basic concepts

of the model, such as utterances, voices, interanimation, and polyphony. A classification and examples of interanimation patterns are provided. Several visualizations of the interactions in CACL chats, provided by an implemented computer application, are illustrating how elements of the polyphonic weaving may be analysed.

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[†] Voloshinov is one of those who made up a group of early twentieth-century Russian scholars that has been called the 'Bakhtin Circle' (Lambirth & all, 2016), or as some have suggested, was the name was used by Bakhtin for publishing while he was banned by the authorities (Holquist, 2002, p.8; Clark and Holquist, 1984, p. 146-7).

[†] [https://en.wikipedia.org/wiki/Main\\_Page](https://en.wikipedia.org/wiki/Main_Page) (Accessed Feb 22 2019)

[§] Appendix One of Major et al (2018) provides the full references for all 72 studies included in this scoping review.

[\*\*] <https://empatiko.org> (Accessed Feb 22 2019)

[†††] <https://generation.global> (Accessed Feb 22 2019)