Technology and Dialogic Space: Lessons from History and from the 'Argunaut' and 'Metafora' Projects

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Abstract: In this theory paper we define dialogic space and outline its importance to computer supported collaborative learning. We argue that dialogic space is a complex concept combining transcendental and empirical aspects to account for the situated opening of opportunities for creative understanding in the tension between different perspectives. Despite this complexity dialogic space can be operationalized in concrete designs for learning. Some general principles are developed through a review of the literature on the indirect relationship between communications technologies and dialogic space. The EC funded Argunaut and Metafora projects to design online dialogic education environments are then used to illustrate more specific affordances of online design for a dialogic pedagogy.

Introduction

An account of dialogic education giving a central role to dialogic space as opposed to socio-cultural accounts that focus on mediation by cognitive tools was put forward by Wegerif in the first issue of the International Journal of Computer Supported Collaborative Learning (Wegerif, 2006). The concept of dialogic space was then elaborated in a book in the CSCL series, entitled Dialogic Education and Technology: Expanding the Space of Learning (Wegerif, 2007). The notion of dialogic space put forward in these two publications has proved of value for some empirical investigations, in particular several studies of Interactive Whiteboards (IWBs) in the UK have found the notion of dialogic space useful for theorizing the impact that this technology can have in classrooms (Mercer, Warwick, Kershner, Kleine Staarman, 2010: Scott, Ametller, Mortimer, and Emberton, 2010: Hennessey, S. In press). Others, however, have expressed concerns about the abstract nature of the concept asking how it can be operationalised and concerns that it does not give an adequate account of the active role that artefacts in supporting learning through educational dialogues (Hakkarainen, personal communication, Jerusalem, 2008). This paper is a response to these concerns. In it we outline exactly how being drawn into dialogic space is related to learning to think, how the concept of dialogic space can be operationalised in designs for CSCL and the affordances of designs with technology for supporting a pedagogy based upon the central notion of dialogic space. Although this paper is essentially a theory paper we also draw upon examples from two large funded projects in which designs for dialogic education with technology have been developed: the current Metafora project (www.metafora-project.org) funded by EC Framework 7 and the recently completed Argunaut project (www.argunaut.org) funded by EC Framework 6.

Dialogic Space and Education

Dialogic space is the space of possibilities that opens up when two or more incommensurate perspectives are held together in the creative tension of a dialogue. We use the term 'incommensurate' in this definition to emphasize the importance and the ineluctability of the dialogic gap. In real dialogues we speak from different embodied perspectives on the world and this difference cannot be simply resolved into unity because I cannot become you and you cannot become me. As Bakhtin points out on many occasions this difference is not a 'problem' but is constitutive of the flow of meaning in dialogues.

In analyzing why some groups were able to solve problems and other groups were not in primary schools it was argued that a key difference was the extent to which the way in which the children talked together opened up a shared space of reflection which allowed creative solutions to emerge (Wegerif, 2005). Because unsuccessful groups tended to identify with narrow images of a bounded self in opposition to others (disputational talk) or an image of the group itself as a harmonious entity (cumulative talk, from Mercer 2000) it was initially argued that the more successful talk involved an identification with the space of dialogue (Wegerif and Mercer, 1997). More recently it has been argued that this notion of identification with dialogue improving thinking is better understood in terms of a developing dialogue with the infinite other (Wegerif, 2010, p80). The idea is that while in a dialogue we might start just trying to persuade the other person, in doing so we inevitably listen to our own arguments as if from an outside point of view. This is the witness position, or the 'third' position, that Bakhtin writes is generated by every dialogue and refers to as the 'superaddressee' (Bakhtin, 1986). Bakhtin argues that words in dialogues are not just aimed at specific others they also become aimed at a sort of otherness in general. By following Bakhtin's logic the argument can be taken further towards a notion of dialogue with the infinite other or the idea of the outside. The argument is one of infinite regress. 1) Every dialogue generates a 'witness' position. 2) This witness position might appear to have a location but if you try to pin down this witness position in order to dialogue with it you will find that another witness position is

automatically generated. 3) Because it can never be grasped, because it always runs away from us when we try to catch it, dialogue with the witness position leads on to dialogue with the infinite other. This analysis of infinity implicit in dialogues enables us to understand more clearly how children learn to reason. First they are called to explain themselves in dialogues with specific others. In the act of doing so, they become drawn into a dialogue with a third position that every dialogue generates, the position of the witness or super-addressee. While this might initially take a specific cultural form, such as the embodied norms of the community, every such fixed notion of the super-addressee can also be questioned leading to the idea of dialogue with the infinite other. The infinite other is not, of course, some kind of 'thing' but more like a constant call to go beyond prejudices and assumptions in order to see one's situation as if from the outside. Another way of putting this is that being drawn into dialogue with the infinite other is about acquiring a passion for truth (Wegerif, 2010, p81).

The significance of dialogic space for education can be understood through contrasting it to Vygotsky's notion of the Zone of Proximal Development or ZPD. With the ZPD Vygotsky introduced a particular version of the idea of a dialogic space into education. Through mutual attunement in the ZPD adults bring children to see things from their point of view thus leading children to reinterpret their initial spontaneous concepts through the more developed already existing 'scientific' concepts of the culture embodied in signs (Vygotsky, 1978). Vygotsky and his followers tend to present learning to think solely in terms to the internalization or personal appropriation of cultural tools such as signs through the medium of dialogue in the form of the ZPD. So for example Vygotsky claims that children learn to think logically through formal schooling, which leads them to personally internalize the categorizing practices of school science using cultural mediating means such as tables in text books etc. While dialogue in the ZPD is crucial for this vision of education this dialogue is assumed to take a rather limited and asymmetrical form. Vygotsky's account is a good account of how children learn bounded areas of thought such as, for example, how they may learn to use specific concept words appropriately or how they may learn to use an abacus to solve mathematics problems. However, it does not account well for how children might learn to think in an open-ended critical and creative way. To do this we simply need to augment the Vygotskian account of learning with the understanding that children do not only internalize or personally appropriate cultural tools such as logical tables and concept words, they also internalize or appropriate the dialogic space through which such signs are able to mean in the first place. Learning to think for oneself is learning to carry around a space of dialogue through which anything and everything can be questioned and seen in a new way.

So a concept of dialogic space is essential for understanding education into thinking and creativity but what exactly is dialogic space? Clearly it is not visible or tangible in a direct empirical manner. Looking from the outside we may see people apparently in dialogue but we cannot directly see the dialogic space of possible meanings that opens up within the dialogue. From the outside we can say that dialogues are situated in space and time, in culture and in history, but from the inside they escape situation. The virtual landscape of the inside of the dialogue might well refer to the past and the future as well to places at a distance. The meaning of the cultural and historical context we construct in order to situate dialogues is always itself a matter for dispute within dialogues. If, as Bakhtin argues, meaning is only possible in the context of a dialogic gap then it follows that dialogic space is a transcendental concept. Transcendental, as Kant defined the term, means a pre-condition for experience rather than an object encountered within experience. We all have experience of meanings in dialogues and those experiences imply a prior opening of dialogic space that makes them possible. The notion of the infinite other outlined earlier suggests that, contrary to sociocultural orthodoxy, there is an important aspect of all dialogues that is universal, unsituated and atemporal. Viewed from the outside all dialogues are different but experienced from the inside they all share something in common which is the infinite potential to be drawn into self-questioning and reflection which we referred to as the idea that the infinite other is a potentially emerging voice within all dialogues. Bakhtin developed the notion of 'Great Time', a time and space in which all voices can communicate with each other, to explain how it was that he, for example, a 20th century Russian, could enter into constructive dialogue with, for example, the voice of Socrates, a Greek from the 5th Century BCE. However great the differences in culture and history it seems that creative dialogic engagement is always possible and this is so because there is something infinite at the heart of dialogue.

If dialogic space has a transcendental aspect it also has an empirical aspect. Classroom research described in Wegerif (2007) shows that dialogic spaces can be opened up where they did not exist before through the simple procedure of interrupting children's engagement with an interactive game in order to ask them open questions that lead them to predict and reflect. This opening of dialogic space is not directly visible but it is easy to deduce (or, more strictly speaking, to abduce) from the visible indicators such as transcripts of talk. Merleau-Ponty (1968) uses the phrase 'the invisibles of this world' for forms like dialogic space that cannot be directly seen but are not unknowable transcendentals because they have a direct effect on the visible world such that they can easily be seen behind it. Dialogic space then is quasi-transcendental, it is transcendental but also empirical in that it can be opened, widened and deepened in ways that are indirectly measurable empirically. One way to conceptualise this is that dialogic space is an opening within a highly structured surface of an underlying space of possibilities. Depending on the context that opening could be more

or less limited. All dialogues increase the degrees of freedom of thought to some extent, all also have the infinite potential for new meaning described above through the mechanism of the infinite other, however, in practice most dialogues remain relatively bounded to a limited range of alternatives within a clear cultural context.

A Brief History of Communications Technology and Dialogic Space

There is an interesting strand of literature on the intellectual affordances of communications media which can help us understand the relationship between technology, dialogic space and education. In the following very brief review of this literature we will look at what has been claimed for the impact of oral dialogue, written media and the internet on thinking in order to illuminate how dialogic space is shaped by technology and to approach a preliminary understanding of some of the possible pedagogical affordances of new communications media.

Socrates notes in the Phaedrus that the living word of face-to-face dialogues has the potential for stimulating understanding in others in a chain that is endless and so produced 'immortality'. He contrasts this living word of dialogue to the dead words of writing that are just like shadows or ghosts because they are not inhabited and cannot answer back. Many have noted that face to face dialogue assumes a certain 'mutual attunement' between participants (e.g Rommetveit, 1992). Utterances in dialogues do not stand alone but they respond to previous utterances and they are designed to influence the person addressed. In a dialogue, in other words, the other (understood here as the addressee), is not simply outside me but appears on the inside of me shaping my utterances from within even as they form. Even to engage in dialogue I need to be able to see myself to some extent from the other's point of view. Socrate's account of the intellectual power of the living word remains valid today and is a rebuke to those who claim that our thinking is essentially mediated by our technology. If this were true then our thinking would be obviously superior to that of the pre-literate Socrates (as reported to us by his literate student Plato) but in fact this is not the case. However, Socrates shows a certain naivety as to the impact and limitations of the spoken word as a medium of dialogue. The limitations of oracy as a medium of thought have been brought out by others in more established literate cultures.

In oral cultures words are only found in the ephemeral context of face-to-face speech. By the time I have grasped the import of my interlocutor's words they have vanished and I cannot turn back to re-examine them. This means that words, and the ideas they carry, are inevitably closely bound up with time and place. Some have argued, for example, that without literacy there are no universal abstract concepts (e.g Ong, 1982; Olson, 1994: Goody, 1977). Writing, it is argued, enabled ways of thinking that were not possible with face-to-face dialogue alone. One example is the way in which the 'religions of the book' could disembed themselves from a physical context to cross seas and mountains and claim adherents in different cultures. They could separate their truth from places because it was contained in words and so it became transportable (Goody, 1977). The Christian Bible and the Koran are known as 'the word of God'. The spread of Buddhism also depended in the writing down of the Pali Canon and its transportation over mountains and seas to new lands.

As we noted above, Socrates, an oral thinker, is reported as criticizing writing precisely for taking the idea of truth away from the living context of words in face to face dialogues and claiming truth for what he referred to as the dead words of writing (Plato, 2006). In the Christian Holy Bible there is an interesting passage that appears to state that the writing is now closed and anyone adding a word to it will be cursed (The Bible: Revelation 22:18-9). If so then this is indicative of a new idea of truth that arrives with writing. Truth here is perhaps being seen as a closed finished thing of universal relevance separate from a context of utterance.

Of course literacy did not suddenly take over nor did it ever completely replace oracy, but at a certain point, according to Toulmin, it seems to have become the dominant medium for our self-understanding of the nature of thought. Toulmin investigates the nature of 'modernity' and finds it in a shift from respecting dialogic modes of thought to respecting only written modes of thought. Before 1600, he writes, both rhetoric and logic were seen as legitimate modes of philosophy (Toulmin, 1992, p30). He contrasts Montaigne's highly contextualised and dialogic brand of philosophy to the abstract universal certainty sought after by Descartes. After Descartes there was a shift from seeing truth in terms of utterances in dialogues in situations to seeing truth in terms of propositions and proofs that were unsituated and universal (1992, p31). In other words modernity can be characterised by 'monologicality', the assumption that there is only one true perspective or voice, which in turn is an effect of the dominance of written modes of reasoning over oral modes.

Harold Innis, the Toronto based communication theorist who inspired Marshall McLuhan, draws attention to the requirement of empires to have portable written communications. He locates the development of the technology of writing the struggle of empires to impose a uniform, written, law. Writing enabled empires since the very idea of empire is to be able to write the law code at the centre and spread the same law uniformly out to all the provinces (Innis, 1950, p30). The first written law code, that of Hammurabi (2123-2083 BC), served the purpose of centralising power. Innes's detailed accounts show how communications technologies such as paper and print, even horses and ships carrying papyrus scrolls, were all essential to empires and shaped the nature of those empires.

Television and Radio, although electronic media, shared the same one to many nature of print media and so were easily seen by Adorno and Horkheimer (Horkheimer and Adorno, 1972) as continuing the imperialistic tendencies of print. The internet, however, is very different, especially the so-called Web 2.0 iteration of the internet. The internet facilitates participation and the same kind of two-way or multi-way dialogue found in face to face talk but it also supports the communication over distance found in writing.

If orality and literacy impacted on ways of understanding thinking then what impact will the internet have? It is too early to say. While oracy and literacy have had millennia to shape collective cognition, the widespread use of the internet is still just beginning. One possible impact noted by Gabi Salomon some years back (1992) as the 'butterfly effect' and recently made into a best-seller by Nicholas Carr, 'The Shallows: What the Internet is doing to our brains' (Carr, 2010), is to make us all more superficial and distracted. Whereas reading books takes commitment and can lead to depth understanding, use of the internet encourages browsing nuggets of pre-processed information condemning us to superficiality, or so the argument goes. This analysis fits reasonably well with those who argue that the rise of the internet marks the end of the modern self, said to be individual and autonomous. Mark Poster, for example, argues that:

> Electronic culture promotes the individual as an unstable identity, as a continuous process of multiple identity formation and raises the question of a social form beyond the modern, the possibility of a post-modern society (1995, p398)

The claim that new communications technology will usher in a post-modern or post-structuralist reality of fragmented, and multiple identities sounds a bit negative but there is a more positive sounding corollary. The other side of the break-down of the authority of the author is individuals becoming more open to dialogue with others and with otherness. If we accept Toulmin's account that a focus on print has had a monologic effect, turning 'utterances' in dialogues into 'propositions' in proofs; is seems possible then that the internet can restore us to a more participatory and dialogic way of understanding thinking. However, while the internet supports dialogue this is different from the oracy that preceded literacy, for one thing this is no longer a dialogue limited to a physically located community but a dialogue without any necessary spatial limits. David Barton tells an interesting story of how the way he saw the hills near his home was subtly altered after he received comments on his photographs of those hills from correspondents in Germany and Japan via the Web 2.0 photograph sharing site, Flickr (see Lee and Barton, 2011). Ong has argued that practices around writing and reading books led to the formation of a sense of an individual inner autonomous space that contrasted to the more collective identity of selves in oral societies and enabled critical thinking leading to political change. It seems plausible that some forms of blogging promote similar kinds of 'inner space' capable of standing back from and criticizing tradition, but in a collective form without the sense of individual autonomy.

One clear lesson that can be learnt from the literature about the impact of modes of communication on thinking and society is that mentality is not just a causal effect of the technology. Ong brings out how one way of writing and reading can cement communal solidarity, the reading aloud of a manuscript such as the bible which was common in the middle ages (Ong, 1982, p117), whilst another way of writing and reading, silent and solitary writing and reading of books, can support the formation of a separate autonomous inner self able to stand back from the culture around it (Ong, 1982, p129). The message we can take from this is that the apparent fragmentation and superficiality induced by internet use according to Carr and others is not an inevitable effect of the internet but a possible consequence of one way of using this new technology. Just as the previously dominant media of communication, oracy and literacy, can be a part of cultural practices that have quite different effects on thinking, so then can the internet. This analysis suggests a possible role for educational research as determining what are the pedagogical affordances and dangers of the internet and how it can best be integrated into the practice of education.

Argunaut and Design for Dialogic Space

The history of communications technology gives us some clues as to how different technologies afford different possibilities of thought. Writing things down may have led to the delusion of unsituated and ahistorical truth but it also enabled deeper reflection because ideas perdured over time and so could be returned to as artefacts to be re-animated by new perspectives and collectively developed. In other words writing, in the form of journals for example, supported a wider and deeper dialogue on scientific issues than oracy alone could manage. However an aura of quasi-religious closed truth still hangs around printed scientific texts making drawing students into the practice of science as dialogue difficult.

New communication technologies and tools offer many new affordances for dialogue. Computer mediated dialogues expand the 'space' of dialogue by spatialising time so that many can 'talk' in parallel and their different voices can be represented by spatial differences in an interface. Normally this different way of doing dialogue is represented in a kind of traditional playscript with one utterance after another listed in a

temporal sequence. This linear list is a kind of metaphor for the progression of moments in time. Even this arrangement however makes it easy to lose the context of the argument. The Knowledge Forum is an early example of an interface that shifts the dialogue representation from this linear form, one utterance after another, form to a more visual arrangement on a plane more like a concept map. The same move is made by Digalo, an online dialogue environment developed by the EC funded Dunes project and used as part of the Argunaut project) relies on argument maps.

The Argunaut system developed during the project uses the graphical e-discussion environments Digalo (dito.ais.fraunhofer.de/digalo/) and FreeStyler (www.collide.info/software) for students, along with a Moderators Interface (MI) for teachers, which includes a range of awareness indicators and tools for intervention designed to make the task of moderation easier. As well as providing awareness of relative participation, types of messages and the relationships between people through social network diagrams, we also sought to provide awareness indicators for the *quality* of the discussion. Using this system we were able to investigate the hypothesis that the spatialized reasoning of dynamic concept maps supported creative reasoning. (Wegerif, McLaren et al, 2010) We investigated the impact dynamic concept mapping on creativity using a coding for creativity based on a pattern-matching algorithm combined with stimulated recall interviews of participants. Through the interviews we found that the non-linear nature of the maps with multiple ideas co-present stimulated creativity. Our findings were that: 1) the emergence of new perspectives in a graphical dialogue map can be coded for using an intuitive interpretation of the construction of meaning in a dialogue in a way which can be recognized reliably by a machine algorithm; 2) that the trigger events leading to the emergence of new perspectives are most commonly open questions and disagreements and 3) that the spatial representation of messages in a graphically mediated synchronous dialogue offers a pedagogical affordance for creativity. This research supports the view that some normative ideas of argument, even those informed by the idea of dialogue such as the dialectic progression from thesis and antithesis towards a synthesis, have been shaped by the linear text form of writing that is always moving towards the conclusion at the bottom of the page. Dynamic multi-user concept mapping on the other hand also supports thinking but has a greater affordance for the creative emergence of unanticipated new ideas that comes from the co-presence of multiple perspectives without any possibility of overcoming one by another or any sense of the need to move together towards the bottom-line.

Metafora and the Use of Tools to Represent Voices

The follow-up Metafora project is investigating the combination of using induction into online mediated dialogic space as a way of teaching general thinking and creativity. The three year project, funded by the European Commission, is developing new theories and pedagogies to increase learners' awareness of learning together, where children aged 12-16 explore authentic science challenges with classmates. The challenges are based around science topic themes, which are key issues of 21st century science curriculum, requiring children to develop general thinking strategies of new knowledge age. To exploit collaboration and discussion, the challenges will be ill-defined and allow different points of views and priorities.

Metafora promotes dialogic learning in three domains: 1) learning to learn together (L2L2); 2) learning to argue and 3) learning about specific mathematics and science concepts. For the learning to learn together component we have developed and trialed an iconic language standing for different activities and emotional attitudes to help the students, working in groups of 5 to 10, to plan their learning. Using a planning space, students iteratively model their own learning activities and reflect upon them. We are investigating if working with these planning and reflection tools in the planning space raises awareness of the stages and attitudes implicit in successful group shared enquiry over time thus help scaffold novices in L2L2 towards becoming experts.

The model of learning to learn together (L2L2) requires that students become aware of the key variables in successful learning together and learn how to use them. This is like learning to recognize and use a new language. From the literature we propose that some of the key variables include staging or sequencing activities and different types of dialogue. But for young children to learn effective dialogue it is necessary for them to become more aware of the way in which they talk or interact which includes becoming aware of and consciously regulating their emotional attitudes to each other and to the topic.

From a dialogic perspective cognition cannot be divorced from affect because cognition is an emergent property of dialogues, and dialogues are defined not by the exchange of signs, something which could be quite emotionally neutral, but by the intersubjective space of relationship. Relationships always have emotional tone. One of the main reason children and young people fail to learn to learn together in groups is because they fail to recognize and take responsibility for the impacts of their emotions and attitudes towards each other and towards the task. In designing icons to help them become aware of and take responsibility for their attitudes we realized that we were using tools in an interesting way. Some socio-cultural literature has suggested that cultural voices become appropriated by individuals to be used as cognitive tools. In Metafora we are designing tools that evoke

voices. Our icons are representations of attitudes such as being critical, playful, visionary, ethical and so on, which the users have to inhabit in order to speak with the voice of that attitude.

Discussion: the Pedagogical Affordances of CSCL for Dialogic Education

Dialogic education combines teaching through dialogue with teaching for dialogue. As well as learning specific facts and specific skills, dialogic education draws learners into dialogue. Dialogic education at both the individual and collective level seeks to draw learners from what Bakhtin called 'narrow time', a concern only with the local and the short-term, to what he called 'Great Time', the dialogue of all times and all cultures. In classrooms this can be seen in moving children from the structured surface of physical time and space in which things happen but without reflection or the possibility of change towards the opening, widening, deepening and heightening of dialogic spaces. A key mechanism for heightening the dialogue is that of taking the perspective of the superaddressee or witness in order to reflect on what has been said or claimed. This mechanism within dialogues can shift participants from trying to persuade specific others to trying to understand in general.

If dialogic space is the main medium of education and learning to think then what is the role of technology? The answer is that communications technology opens and shapes different kinds of dialogic spaces with different affordances for thought and for education. Our brief accounts of oracy and literacy offered arguments that the medium of communication does make a difference to the possibilities of thought and to the direction of education. It is as if the medium itself becomes a key voice in the dialogue. These accounts also suggested that while technology does offer a framework of constraints and affordances its actual impact on thought and on education will depend on how it is used or how it is embedded in cultural practices. This point is particularly important in understanding the potential impact of the internet age as the internet is not one technology but many bundled up together offering a great variety of different possible uses. The potential dangers of the internet for the quality of thought have been pointed out but reflection on the nature of the internet shows that it also had affordances to support a dialogic education, opening new spaces for dialogue, widening them by introducing diverse voices, deepening dialogue through the provision of continuity in the form of malleable artifacts that allow reflection and analysis and also heightening the dialogue in the direction of dialogue with the infinite other through the reflection that occurs in dialogue across difference.

Design-based research in developing the Argunaut and Metafora systems illustrates how designs for technology can shape dialogic space in a way that has an impact on the type and quality of thinking and so on the possibilities of education for thinking. The research described with Argunaut demonstrated the simple point that the way in which we shape the space within which people communicate has an impact on their thinking. In this case dynamic concept-mapping was shown to support the creative emergence of new ideas through the juxtaposition of multiple perspectives on a single topic. The provisional work-in-progress report from Metafora suggested the significance of designing for voices and for the emotional colors of dialogic space. This represents a shift in pedagogical design principle from using voices as tools for thinking to using tools as voices for thinking.

In conclusion then we are arguing that:

- dialogic space is an opening of reflection and possible new perspectives around a dialogic gap;
- dialogic analysis helps us to understand education for thinking as shifting orientations and drawing learners from dialogue with specific others towards dialogue with the infinite other;
- communications media have different constraints and affordances in relation to dialogic space;
- the design of communications media and spaces offers affordances for different kinds of thinking and so for different kinds of education into thinking;
- artefacts can act like voices in a dialogue supporting continuity, reflection and cumulative development;
- analysis only in terms of tools and 'construction' can miss the point that education, amongst other things, is about helping new participants in dialogue acquire their own unique voice
- in a project to teach learning how to learn together we are exploring what happens when we embody key dialogic orientations in icons which then serve as tools to support the acquiring of voices

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