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Buber, educational technology, and the expansion of dialogic space

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Abstract
Buber's distinction between the 'I-It' mode and the 'I-Thou' mode is seminal for dialogic education. While Buber introduces the idea of dialogic space, an idea which has proved useful for the analysis of dialogic education with technology, his account fails to engage adequately with the role of technology. This paper offers an introduction to the significance of the I-It/I-Thou duality of technology in relation with opening dialogic space. This is followed by a short schematic history of educational technology which reveals the role technology plays, not only in opening dialogic space, but also in expanding dialogic space. The expansion of dialogic space is an expansion of what it means to be 'us' as dialogic engagement facilitates the incorporation, into our shared sense of identity, of aspects of reality that are initially experienced as alien or 'other'. Augmenting Buber with an alternative understanding of dialogic space enables us to see how dialogue mediated by technology, as well as dialogue with monologised fragments of technology (robots), can, through education, lead to an expansion of what it means to be human.

Keywords Dialogic space theory · Educational technology · Buber · Voice · Dialogue

1 The twofold nature of signs

Although not all those who write about dialogic education refer to Buber, all refer, in different ways, to the fundamental distinction that Buber drew between learning from a living dialogue involving responsive voices (I-Thou) and the kind of 'knowledge' that just imposes a single perspective expanding the realm of the same and objectifying all otherness (I-It). For dialogic education, learning is not primarily conceived of as about collecting facts and returning them in an examination, but is about engaging with different perspectives in a way that expands the understanding of the learner and their capacity to see things from more than one point of view[1].

Buber's writing on the nature of I-Thou relations expands our understanding of dialogue. In particular, Buber opens the way to understanding dialogue as more than that intersubjectivity in which two separate consciousnesses engage with each other. Intersubjectivity is part of dialogue, certainly, but, Buber's (1937) accounts of dialogue with non-human subjects such as trees and animals suggest that we need to adapt and expand this model of dialogue.

The 'intersubjectivity' interpretation of dialogue, developed by psychologists such as Rommetveit (1998), begins with the reality of separate consciousnesses and does not question this assumption, viewing dialogue as an exchange between separate consciousnesses characterised by mutual attunement. Buber's analysis suggests that dialogue is more fundamentally rooted in an 'orientation' to the other that opens a space of potential meaning preceding, and exceeding, the self/other distinction. Although Buber did not engage directly with the question of technology, this version of dialogic theory opens the way to understand the essential role that technology plays in dialogue and why it is possible to learn from (e.g.) interactions with a machine.

In the notebooks published after his untimely death Maurice Merleau-Ponty points out that, on a visit to Manchester, it was only when he did not understand what the taxi driver was saying to him that he thought 'those are words there' (Merleau-Ponty 1968). His point was that normally when we use words to speak together we do not notice the

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[1] For a comprehensive overview of the history, main themes, research evidence and key issues and controversies in the field of dialogic education see Wegerif (2017b, in press).

words, we go straight through to the meanings. Merleau-Ponty was influenced by Heidegger, and this observation can be seen as an application of Heidegger's account of 'breakdown' in which our knowledge of objects shifts from being 'ready-to-hand' to being 'present-to-hand' (Heidegger 1996, pp. 66–99). Heidegger pointed out that when we use a tool such as a hammer, we forget the hammer itself as we are aware more of the task we are engaged in. In the act of hammering, the hammer becomes an extension of ourselves. It is only when there is a breakdown, for example, when we miss the nail and hit a thumb instead, that we become fully aware of the hammer as an object in the world. Heidegger's analysis of the embodied nature of knowing was extensively applied to human–computer interface design in a seminal study by Winograd and Flores (1986). The main finding of this analysis is that we only become aware of tools (including words or other signs) as objects when there is a breakdown in the task that we are using the tools for. Good design is when we are no longer aware of underlying and enabling interfaces, but simply extend ourselves to be able to do new things, to see new things and to interact with others in new ways.

It follows from this analysis that when we are using technology successfully our sense of self extends into that technology. This point is expressed in the common saying 'a man with a hammer is a man in search of a nail'. Similarly, Merleau-Ponty did not normally distinguish himself clearly from the words he was using both to speak and to listen. As a result, he was engaged in the dialogue until there was a breakdown in communication that forced him to step back from dialogue and realise that 'those are words there'.

Merleau-Ponty's simple anecdote points to the dual nature of signs as both objects in the world (such as words audible in the air or visible when written down), and as the invisible medium of relationships in which our sense of self is extended to include others we are in dialogue with. A version of this duality lies at the heart of the new discipline of 'presence' in immersive virtual reality environments (IVR), that is, 'the illusion of being here or there' (Biocca 2001). In IVR, presence happens when the 'signs' of artificiality disappear into an experience of reality. However, when, like Merleau-Ponty, we find ourselves thinking "those are signs there—what do they signify?", we experience a 'break in presence' (i.e., we stop responding to the virtual stream of data and instead respond to the real sensory stream; Slater et al. 2003).

Buber begins his classic work I and Thou (first published in 1923 and translated to English in 1937) with the claim that "man is twofold", and draws our attention to the two fundamental modes of being: 'I-It' (Ich-Es) and 'I-Thou' (Ich-Du). The I-It mode generates a world of objects blocking the view such that we often find ourselves trapped within it. The I-Thou mode on the other hand leads us into the presence of another person and, more fundamentally, into the presence of what Buber refers to as 'the Eternal Thou'. He explains that being in relationship is a very different kind of being from the being of the It-world—the world of things. Whereas the realm of I-It is fragmented, one thing next to another, one he, one she, one it, etc, the realm of I-Thou is an experience of wholeness (Buber 1958).

In this paper we build on Buber to argue that constructive dialogue with technology is possible, even essential, and that this takes the form of opening a dialogic space (Buber's "das Zwischen" or the "space of the 'in-between'"). However, we also argue against Buber that dialogic spaces do not all take the same form, but that they take a multitude of forms depending, to a large extent, on the mediating technology.

Buber's account of the relationship with the Eternal Thou points to an underlying truth of dialogue, but, from the perspective of human experience, it is also an extreme case or exaggeration. Most dialogic spaces are spaces in which we experience multiple voices within a world. This world is not always or simply an encompassing physical world—it is a culturally meaningful world, mediated by communications technology, where the I-It and the I-Thou are mutually intertwined in ways that are framed by technological design. The expansion of dialogic space is an expansion of what it means to be 'us' as dialogic engagement facilitates the incorporation, into our shared sense of identity, of aspects of reality that are initially experienced as alien or 'other'. Therefore, for example, when signs take us straight through into living dialogues with other voices, our sense of 'us' expands to include others in a shared dialogic space. However, when there is a breakdown, perhaps the image of a face talking on the screen becomes frozen, then we are projected back into a reduced sense of self.

The idea of an expansion of what it means to be 'us' does not work if we assume a monologic identity. In a dialogue, I do not expand to incorporate you in some monologic or totalitarian manner. The idea of the expansion of 'us' in the expansion of dialogic space is based on the assumption of dialogic identity. This is a twofold or dual identity. In a dialogue, when one speaks in active mode, one identifies with one's own speaking voice as different from the other voice. However, if the dialogue is to be a shared inquiry within which learning occurs, there is also a second level of passive identification with the dialogue as a whole which includes all the other voices and oneself as a voice amongst them. Tacitly the other voices are allowed across the threshold of the self. One listens to them, and learns from them, much as one listens to and learns from one's own voices (Bakhtin 1981, p. 343).

In this section, we have begun to consider the seminal nature of Buber's work for the field of dialogic education with technology, including his interpretation of opening a dialogic space (which has particular implications for the

analysis of dialogic education with technology). We have also discussed the twofold nature of signs, relating this to Buber's claim that there are two fundamental modes of being. In the next section, we examine the twofold nature of technology, and how our use of language is also a technology. We follow this by drawing on examples from the history of educational technology to reveal the role technology plays, not only in opening dialogic space, but also in expanding dialogic space. In doing so, we augment Buber with an alternative understanding of dialogic space to enable us to see how dialogue mediated by technology, as well as dialogue with monologised fragments of technology (robots), can, through education, lead to an expansion of what it means to be human.

2 The twofold nature of technology

In an article about technology, education and also what it means to be human, it might seem important to define terms. Buber's two modes of being, the I-It objectifying mode and the I-Thou dialogic mode, are also relevant to the issue of definition and, more generally, how we understand concepts and the nature of conceptual thought. In the I-Thou mode every part is, as Merleau-Ponty put it 'a total part', that is a kind of metaphor or way of seeing the world (1968, p. 218). What is and what is not seen as technology changes and develops over time and across cultures, as do our ideas of education and what is included and excluded in the term humanity. If we switch from I-It to I-Thou mode we find that these terms, technology, education and humanity, do not so much refer to substantive areas of a reality already 'out there', but to orientations that we can take up and that shape our ways of thinking and of being.

When people talk of technology in relation with education they seldom mean the long-established technologies of pens, ink and paper, or blackboards and chalk, or even printing presses and books. They almost invariably mean 'new' digital technologies like tablet computers (e.g., iPads) and interactive whiteboards. That is interesting, and suggests that where technologies have become part of everyday life they are no longer experienced as technology. If they are not experienced as technology this is because they are experienced as normal, as natural and, indeed, as extensions of 'us' or what it means to be human. We only say 'that is technology there' when we do not accept it as part of our humanity but experience it as alien and, therefore, perhaps, as changing us, limiting us and controlling us in ways that we might not want.

In this article we take technology broadly to refer to what Vygotsky (1986) called 'mediating means' enabling communication and action. This includes spoken and written language, along with more obvious tools such as computers. Although of course there are many differences in educational technologies and their uses in different contexts, we choose to focus upon that which unites them all which is their role as mediating means within the teaching and learning relationship. Our argument is that education has always been shaped by the mediating means used but that commentators have not always shown awareness of this. In keeping with the dominant assumptions of his time, Buber writes of dialogue, and even educational dialogues, as if these were unmediated. Becoming aware of the importance of mediation to dialogues enables us to see how we can change the technological form of the mediation in order to expand the dialogue.

Bernard Stiegler argues that Western philosophy has been shaped by a systematic avoidance of the question of technology. Whereas humanity has consistently been defined against technology, in fact we find that it is technology that initially defines the human and that continues to co-evolve with the human in a mutually constitutive way. According to Stiegler, quoting various empirical research sources, the development of hand-stone technology freed the mouth for vocalisations and these two technological developments, tool use and speech, led to the development of the frontal cortex:

> This ground breaking [frayage], which is that of corticalization, is also effected in stone, in the course of the slow evolution of techniques of stonecutting. An evolution so slow—it still occurs at the rhythm of 'genetic drift'—that one can hardly imagine the human as its operator, that is, as its inventor; rather, one much more readily imagines the human as what is invented (Stiegler 1998, p. 134).

In this way Stiegler suggests that the 'human' is always already technological. More than that, each generation finds itself in an already technologically shaped reality where our way of thinking and our capacity to think at all is already mediated by technology, since, for Stiegler, it is only technology that brings in the space of difference required for reflection, particularly the technology of language.

Perhaps we do not normally refer to spoken language as a technology because it seems so close to our flesh, words carried on warm breath seem like a natural extension of our bodies and so of ourselves. Yet when we switch attitude to an I-It stance and observe them as if from the outside, we can see, as Merleau-Ponty suggested, 'those are words there'. In doing so, we realise that language is also a technology, albeit one of the very first human technologies, and one that provides a supportive medium for many others.

Following Simondon (1958, 2001), Stiegler argues that technologies have their own logic of development. The tendency for initially different technologies to universalise and integrate in global systems might not be driven by human desires but by a technological logic. Stiegler's rethinking of

history from the point of view of technology suggests that we may be deceiving ourselves when we tell the story of how humans have used technology for their own ends. In fact, it might be just as plausible to see the history of humanity as the story of how technology has recruited humans to serve its ends. School education is a good example. It is experienced by many children as unnatural and painful, but is required if the technology of literacy is to be able to work. This suggests that technology is not an optional extra that we can ignore but, rather, is essential to our nature. In doing so, technological drives combine with, and co-evolve with, human drives and continue to define who we are and how we develop over history.

If modern humanity, through educational means such as alphabetisation, are impregnated with technology on the inside, so technology, in all its forms, is closely intertwined with humanity. Just as we tend to confuse people with their biological bodies, so we tend to confuse computers with their silicon, metal and plastic boxes. However, first and foremost, computers are made out of language. The first computer existed only as marks on paper written down by Alan Turing in the form of a set of procedures. The language game behind computers was, and remains, monological; it is one of formal logic that seeks to maintain self-coherence. This is a 'technical' use of language designed specifically to remove the ambiguity that comes from dialogue between a multiplicity of voices in order to leave only one true perspective (Pylyshyn and Bannon 1989).

Digital technology is made from language fixed in the objective 'I-It' mode. However, for Buber intelligence is an effect of I-Thou communication. It follows that claims of Artificial Intelligence (AI), at least as these are applied to silicon-based digital computers, are greatly exaggerated.

3 Lessons from ELIZA and computers in the classroom

3.1 ELIZA

Turing famously proposed a test for AI—the 'Turing Test'—if a computer could fool an interlocutor that it was human then it would pass the test (Turing 1950). This has been criticised as a profoundly silly idea confusing simulation with reality, or a map with territory, as it is a bit like saying that if a computer can simulate the digestive system then it can digest food (Searle 1990).

To demonstrate the limitations of the Turing Test model of AI, early computing pioneer Joseph Weizenbaum created ELIZA, a very simple pattern-matching machine designed to fool listeners into thinking it was another human on the model of a psycho-therapist (Weizenbaum 1966). Whatever the person asked, Weizenbaum's program would send it back. For instance, if you ask it a question it replies, 'we are talking about you not me', or if you mention a keyword like 'mother' it will say, 'tell me more about your mother?'. Weizenbaum's aim was precisely to undermine the hubristic thinking of AI by demonstrating the dumbness and simplicity of his software. This has been referred to as an idea of 'artificial stupidity' (Wegerif 2007) and yet, of course, it had the potential to convince people for a while that they were in a real dialogue.

Weizenbaum was genuinely surprised that intelligent people who knew the simplicity of his software spent hours in conversation with ELIZA (Weizenbaum 1976). It turned out, however, that talking to ELIZA helped them with their problems. Versions are still in use today to assess individuals' cognitive and/or emotive weaknesses or difficulties, and to then offer the means to overcome them (Bainbridge 2008). A variation of this approach, AVATAR therapy, has recently shown large clinically worthwhile benefits for mentally ill patients experiencing persistent distressing voices. AVATAR makes use of digital representations of psychotic experiences to provide a controlled, but realistic, therapeutic encounter (Craig et al. 2018). It seems that externalising voices and dialoguing with them helps patients to gain insight, greater control and ultimately supports change.

ELIZA proves Buber right. While psychologists have defined dialogue as a form of intersubjectivity only occurring between two active separate consciousness (e.g., Rommetveit), Buber proposed that it was more a matter of attitude—of orientation towards the other. With a dialogic orientation it was possible, for instance, to enter into dialogue with a cat or tree (Buber 1958).

While the tension of incommensurability between two external consciousnesses will open up a dialogic space when a dialogic attitude is taken, the initial externality and spatial separateness of other consciousnesses is not a necessary condition for dialogue. It turns out that dialogue is not so much intersubjectivity as opening up a dialogic space of reflection and resonance. AVATAR shows how this space of dialogue can be opened up as much by the tension between internal voices, enhanced by external technology acting as a simulated dialogue partner, as by that between external voices.

In 1997, IBM's Deep Blue super-computer defeated chess grandmaster Gary Kasparov. At the time, predictions were made that machine intelligence would soon outperform human experts and displace decision making in a range of fields (Vardi 2012). Instead, years later, the chess world would conclude that decision making was not a matter of machine vs expert, but machine plus expert (Goldstein et al. 2017). This so-called Centaur model features man–machine teams that work together on problems and can outperform either people, or computers, working alone (Swartout 2016). Recently, it has been suggested that Centaur human–machine

collaboration could be implemented immediately to improve outcomes in a range of complex fields (e.g., cancer care; Goldstein et al. 2017).

The stories of Eliza and AVATAR offer examples of humans collaborating with machines in a way that augments and extends the person on the Centaur model. This is what Perkins referred to as 'Person-plus' (Perkins 1993). In the use of ELIZA and AVATAR the aim is not a computer as an alternative consciousness or AI, but rather the computer as a constructive dialogue partner able to augment and extend the reflective intelligence of our own human dialogues.

3.2 Computer-supported classroom dialogue

Digital technology is built out of our language and yet often appears to us as 'other' or as 'alien'. ELIZA did not appear to interlocutors as alien and is an example of what happens when computers are treated in 'I-Thou' mode and are allowed to have voice. This I-It/I-Thou duality of computers can enable them to be a good tool to support dialogue in the classroom.

Computers as partners in learning conversations have an ambivalent ontological status. On the one hand, educational software can be made to respond appropriately to inputs in such a way that users feel the need to explain their responses in psychological terms: it is common to say, for example, that the computer thinks or makes mistakes. On the other hand, even young children quickly learn that computers do not have the feelings, expectations and implicit judgements that human conversational partners invariably do have (Turkle 1996). This difference can be summed up as due to the fact that computers appear as objects, machines, that can be programmed to act as if they were subjects, people. This ontological ambivalence of computers equips them, in combination with the right educational software and supporting pedagogy, to play a unique role in supporting teaching and learning dialogues.

In the literature, a dominant interactional exchange between teachers and students in the classroom is referred to as IRF—Initiation, Response, Feedback (Howe and Abedin 2013). For example—I: 'What is the capital of France?' R: 'Paris' F: 'Yes—well done'. The claim has been made that providing only brief factual answers to IRF exchanges will not give children suitable opportunities in which they can practice using language to reason, reflect, enquire and explain their thinking to others (e.g., Mercer 2003). When Seymour Papert (1980) condemned the use of computers as tutorial machines, instead praising their use as open-ended environments in which to build and explore, he failed to take account of Buber's I-It/I-Thou duality. In condemning the use of computers as tutors he was implicitly assuming that they necessarily had the same conversational impact as teachers.

Applying Buber's I-It/I-Thou duality to understanding computers in this situation shows that the implicit claim that IRF interactions with computers have the same effect as IRF interactions with a human 'tutor' are not necessarily warranted. Computers are an obvious 'It' that can only simulate a 'Thou' mode. For example, students can wait before they answer a computer without feeling that they are showing a lack of respect. Indeed, students are not likely to feel 'controlled' by computers in ways that they might feel controlled by a human tutor taking the same role; as a result, simple IRF interactions with computers can support discussion, reflection and the active construction of meaning in a way that they may not normally do so with human teachers. This claim is summed up in the idea of an IDRF educational exchange around computers where the 'D' stands for discussion between students. A combination of pedagogy and software design can exploit the ambivalent nature of computers to make them serve as both interactive agents, or 'tutors', and as passive 'learning environments' within the one educational exchange (Wegerif 2004). This educational dialogue model (IDRF) is an example of Centaur human–machine collaboration, making use of a combination of the very different affordances of humans and machines to maximise learning.

In other words, computers can open dialogic space and are good at inducting students into the longer term dialogues of culture. The very fact that computers are not human and have their own limitations are why they can be very productive talk partners. In the previous section we considered how, in some contexts, this difference between computers and humans can be of benefit (e.g., in psychotherapeutic interactions). The combination of a humanlike ability to ask questions with a machinelike patience and lack of judgement also has potential to be very effective in other learning situations, for instance, to help children with autism spectrum disorder [i.e., because computers are dialogue partners (I-Thou) who actually have no subjectivity or real intelligence to worry about (I-It)]. Indeed, there is growing evidence on the potential applications of using technology as a means of enhancing the life skills of such children (Yasar 2016).

4 Dialogic space

In addition to talking about the shift from the 'I-It' attitude to the 'I-Thou' attitude, Buber also articulated a view that dialogue takes place in "das Zwischen" or the "space of the 'in-between'" (1937). This is the first clear reference to the idea of opening up a 'dialogic space', a concept now increasingly used in education (Lambirth 2016).

Dialogic education takes place through dialogue, which means opening up a shared space so different perspectives can interact and new learning can occur. This notion of an

internal or lived experience of a shared dialogic space is central (Mercer et al. 2010). In teaching through the opening of a shared dialogic space, dialogic education draws learners into participation in the processes through which knowledge is constructed and validated. In other words, dialogic education promotes dialogue as an end in itself.

While Buber points us to dialogic space, he mystifies this by ignoring the role of technology (defined broadly—as discussed in Sect. 2) in opening and sustaining it. Furthermore, Buber's dialogic space is not the kind of space that could be expanded because it is always presented by Buber as outside of space and time. To understand how dialogic space can be expanded by technology, we must consider an alternative conceptualisation of dialogic space in education. This alternative conceptualisation arose from applied educational research involving the exploration of the impact of different types of talk on students' learning (in upper primary/elementary classrooms with children aged 8–10). Three significant types of talk were identified (Mercer 1995; Wegerif and Mercer 1996): disputational, cumulative and exploratory. Two of these types could be clearly characterised by orientations and identifications used by the learners. In disputational talk children disagreed with each other without giving reasons, identifying with their own self-image or ego and each wanting to be the one to 'get' the answer. In cumulative talk children often identified with the image of the group as a harmonious unit and so did not want to criticise (i.e., agreeing with each other but not giving reasons). The form of identification determined to be associated with 'exploratory talk' was the ability to change one's mind as a result of engaging in talk with others. This prompted the question, from what position is it that individual learners are able to look at what they have said, find it wrong, and so change their minds? Conceptualising this practical issue in such a way led the research team to introduce the idea of identification with a 'space of dialogue' or 'dialogic space' (Wegerif and Mercer 1997; Wegerif 2007).

There is a difference between this version of dialogic space and Buber's. While Buber's 'in-between' is always a highly abstract notion, the theory of 'dialogic space' outlined above has a concrete aspect. This was seen recently during research undertaken in Japan when a group of three upper primary children were arguing about a puzzle presented on a tablet computer. Not only did their body language converge on this central focus, but so did their fingers. Each put a finger on the tablet to point out what they thought the key to solving the puzzle was. Pretty soon it was clear that much of the shared thinking was being done by their fingers (Fujita, in preparation).

Before dialogic space opens up, things tend to be thought of as located in space using the default 'identity ontology' or everyday monologism that Buber characterised as the I-It mode. Identity ontology suggests that 'a thing is what it is and not another thing' (Thompson 2012). When dialogic space opens up, however, then material objects, bodies, hands, voices, gestures, and pixels on the screen become signs for other things and representative of voices that are not present. The pepper and salt pots on the café table are just pepper and salt pots. Depending on the dialogue, however, the pepper pot could become Lionel Messi scoring a goal in soccer for FC Barcelona, dribbling brilliantly around the salt pot and into a goal marked out by knives and forks. Or, the two pots could represent the relationship between a proton and a neutron in a deuterium atom surrounded by an electron cloud of scattered pepper on the table. In fact, these two simple objects could stand in for almost anything at all.

Although each opening of dialogic space is unique, all dialogic spaces, once opened, share something in common. While in practice any given dialogic space might have a limited range of themes and probable outcomes these cannot be determined in advance because, in principle, any real dialogue opens up a potential for infinite meaning. As Bakhtin (1986) suggests, there can be no last word in dialogue. This idea of the potential for infinite meaning relates to Buber's idea that all dialogues involve us in dialogue with the 'Eternal Thou' (Buber 1958), but could also be seen as just another way of saying that the context that could be brought into play in any dialogue is unbounded. Referring in the singular to dialogic space, rather than dialogic spaces, draws attention to this unity of the structure of dialogic space as always opening up unbounded contextual meaning within the diversity of specific contexts. However, of course, dialogic spaces are also all different in their physical location[2].

Buber overlooks the role of technology in writing of dialogic space always in the singular in ways that imply that it is always outside of space and time. Buber's dialogic space was clearly not the kind of space that could be measured such that one could say it contracts or expands. Wegerif's version of dialogic space, because it has one pole situated in the everyday experience of space and time, can be understood to expand in so far as it includes more voices and a deeper questioning of framing grounds. This is something we explore in the following section.

[2] The neologism of 'dialogic space(s)' would be the most accurate term with the singular 'space' referring to the unbounded ideas side and the plural 'spaces' to the physical concrete side.

5 Illustrations of the expansion of dialogic space from the history of educational technology

The history of educational technology, understood broadly as the mediating means within the teaching and learning relationship, provides a simple demonstration of our claim that technology can change dialogic space and expand it in ways that have educational significance.

5.1 Cave paintings

Educational technology can be traced back at least 40,000 years when early tools were used to communicate through cave paintings (Barton and Baguley 2017, p. 274). This involved early humans using "cutting-edge" technology, for the time, to explain their surrounding physical world and to fulfil a need to communicate knowledge and experience with others (Teehan 2006, p. 7). In this sense, cave paintings acted as an early form of educational technology as they allowed of a new type of cognitive processing; that is, cave art enabled the extension of human cognitive abilities ("out of the skull and into the world") and the externalisation of information (Gray 2010).

Fifteen thousand years ago, the Paleolithic denizens of the Lascaux, Pechmerle or Altamira caves laboured to represent aspects of reality which were vital to their life (Mioduser 2005). Other cave paintings, exhibiting similar themes in various areas around the world, are estimated to be over 25,000 years old (Gray 2010). Initially, these paintings were widely thought of as a kind of magic intended to increase the number of animals and improve the hunt (a theory developed primarily by Abbe Henri Breuil, interestingly around the same time that Vygotsky developed his notion of tool-mediated action—see Edwards (2005) for an overview). This 'hunting magic' theory was dominant until it was contradicted more recently by Lewis-Williams (2002) and others (e.g., Spivey 2005) who highlighted that the animals painted in the caves did not reflect local diets.

Lewis-Williams (2002) presents ethnographic evidence based on transcribed notes of interviews with San hunter-gatherers from the 1870s to conclude that the cave paintings were, in effect, a form of educational technology. He suggests that Shamans, or those able to voluntarily enter into trance states and see visions, used the paintings to record visions and evoke them later.

The idea of early civilisations utilizing cave paintings to evoke spiritual energies after engaging in activities to induce an altered state of consciousness does sound rather remote from our conception of contemporary education and technology. This example is interesting, however, because the suggested use of the paintings is clearly educational. Following an initiation ceremony involving what could be called a pedagogy of extreme challenge (e.g., sensory deprivation; Clottes 2008), the cave art was used to provoke an encounter with 'voices' that are not everyday but belonged to the shared cultural life of the tribe. These voices inhabit not normal space and time but rather a type of cultural spirit world (Lewis-Williams and Pearce 2004).

To enter this world via the mediation of the cave painting, 'learners' had to de-identify with their everyday world and self. The painted walls of caves operated like a thin membrane between the everyday world and spirit world beyond, a membrane that the Shaman could cross at will serving as a guide for others (Lewis-Williams 1997, 2002). On the other-side was a world of shared visions, which the new members of the community could be initiated into. Thus, this early form of education enabled individuals to become 'fully human' as they entered the cultural life of the tribe by engaging with spirit voices often referred to as the ancestors of the tribe. In doing so, they acquired a spiritual body in the shared spiritual space of the tribe, in addition to their original physical body in the shared physical space.

Paintings on the cave wall had an I-Thou quality for members of the tribe that used the cave. The shapes of animals would come alive and talk back. However, to outsiders they just have an I-It quality. We see them only as pictures and not as voices. However, for the tribe who painted them, by perduring over time, over thousands of years in many cases, cave paintings provided voices that could support continuity and development as each new generation were inducted into an ongoing dialogue with their ancestors. As an education technology, this expanded the space of dialogue with the spirit voices of the tribe in a temporal direction, but less so a spatial dimension (see Innis 1950).

The idea of dialogue with spirit voices needs considering here. This was something that Buber explicitly addressed and included in his understanding of dialogue. Bakhtin, who was influenced by Buber (Clark and Holquist 1984), and whom once said that he thought of Martin Buber as "the greatest philosopher of the twentieth century" (Freidman 2001), made some sense of the almost universal experience of dialogue with spirit voices through his concept of the super-addressee:

> "[I]n addition to [the immediate addressee] the author of the utterance, with a greater or lesser awareness, presupposes a higher super-addressee (third) whose absolutely just responsive understanding is presumed, either in some metaphysical distance or in distant historical time... In various ages and with various understandings of the world, this super-addressee and his ideally true responsive understanding assume various ideological expressions (God, absolute truth, the

court of dispassionate human conscience, the people, the court of history, science, and so forth)" (Bakhtin 1986).

This idea of the super-addressee as an invisible witness or perspective who participates in all dialogues suggests that we are always dialoguing with cultural voices, the voices of the ancestors perhaps, as well as with physically present humans. George Herbert Mead, for example, referred to the importance of the voice of the Generalised Other or 'what everybody thinks' for learning to reason within a community (Meade 1934). However, following the logic of Buber, these naturally emergent super-addressee voices should not be reified in I-It mode. Whenever they are, as with fixed images of 'what everybody thinks', or fixed images of God and goodness, then when we engage with them in I-Thou mode a new super-addressee (witness) emerges, and then a new one and so on. That is, if you try to pin down a super-addressee position in order to dialogue with it you will find that another super-addressee position is automatically generated. Buber's intuition that the real dialogue is ultimately not with this or that pinned down and circumscribed 'Thou', but with what he calls 'the Eternal Thou', therefore, is supported by Bakthin's super-addressee idea (Bakthin 1986, p. 126).

5.2 Writing

Socrates was an oral thinker who lived and taught during a time when there was transition to a new communications technology, the technology of alphabetic writing. This new technology was impacting the nature of education in a way that troubled Socrates. Somewhat ironically, however, we only know this because Plato wrote down Socrates' reflections on writing in the dialogue with Phaedrus, where he is reported as describing written words as like 'orphans', 'ghosts' and 'dead seeds put out on flagstones in the heat of the sun' (Plato—Jowett Translation 2008; Manguel 2014). In Buber's terms, Socrates did not see written words as voices that could be in dialogue with each other, but only as 'Its' (i.e., as objects without life).

Words that are spoken tend to disappear almost as soon as they are heard. Without recording them, they remain in the context in which they are spoken. The social anthropology of oral cultures reveals many wise people like Socrates with interesting things to say, but we only know of these because the anthropologists are literate and write down their sayings just as Plato did for Socrates. If cave paintings and early monuments like pyramids extend the educational dialogic space of a group in a temporal direction, writing enables also a spatial expansion beyond one tribe to other tribes and indeed, potentially, to all tribes (Innis 1950).

Arguably, only writing words down enables extended memory and education into participation in the dialogue of a collective humanity. Oakeshott (1959) writes of education as induction into a vast 'conversation of mankind' which, 'begun in the primeval forests and (is) extended and made more articulate in the course of the centuries'. In this conversation students can discover the voices of Socrates and Plato but also Confucius and Lao Tze, Buddha, Rumi and more from all periods and all regions. This is possible only because, and only in so far as, these voices are written down. From face-to-face dialogues in small groups, the technology of writing enables us to expand to a global dialogue.

Socrates turned out to be wrong about writing. Despite being in the form of external signs—that is, despite being an obvious technology—writing can also support voices and the dialogue between voices. Bakhtin developed his understanding of dialogic through considering the dialogue between and within texts, in particular the dialogue between voices within Dostoevsky's novels (Bakhtin 1984). In one sense this returns us to the context of AVATAR therapy referred to previously, in which mentally ill patients externalise and dialogue with their distressing voices mediated by computer technology (Craig et al. 2018).

Dostoevsky's novels were Dostoevsky talking with his voices externalised in the technological form of a novel. While this was not, for instance, in the form of a computer game, many people have found it to be illuminating and enlightening nonetheless. Dostoevsky's voices expanded the cultural dialogue for generations of readers who learnt from the dialogue between Ivan and Alyosha Karamazov. This illustrates how the technology of writing, plus education, can expand dialogic space.

5.3 The internet

For over 20 years, the Internet has been replacing print as the dominant medium of communication (Poster 2001). In doing so, it offers a return to some of the dialogic affordances of oracy as, on the Internet, there is always the potential of living relationships with multiple voices. Moreover, there is no way of stepping outside of this dialogue into a position of certainty.

The dialogue of humanity now appears in real-time online. The role of education today is not simply to induct students into their inheritance of written cultural voices, but also to induct them into participation in this living dialogue. 'Cyberspace' is an imaginary, but nonetheless real world, where the frontiers are blurred and the 'other' exists through the inference of communication (Breton 2003). It is not an external space that can be measured in terms of servers and fibre-optic cables: it is a dialogic space supporting the interplay of potentially billions of voices.

The internet is, in many ways, a new cave (see Sect. 5.1). The screens our young people are so fascinated by provide a means for them to step through into a collective cultural

world. The signs on the internet are multi-modal, not simply grey words on the page but pictures and living video images. Increasingly, with the aid of headsets, the full experience of stepping through into 3D reality is offered. This is a return to the experience of those creating cave paintings 40,000 years ago, but, with a big difference—the Internet is open. It is not inducting us into one tribal reality that will close us off from other tribes, or, at least, it has the potential not to do so. Rather, it has the capacity to support a borderless dialogue with infinite creative possibility and also intrinsic democratic potential (Fuchs 2005).

Engagement in educational dialogues online offers a new form of dialogue not found in face-to-face situations or in dialogue with computers in classrooms. The Internet has an affordance for a new kind of education that could be called peer-to-peer learning. This new form of educational dialogue combines a focus of interest—lets us call this the question—with resources generated by others that can help answer that question. Of course, here the Internet is not being viewed as an external network, but internally from the point of view of participation. This kind of education is through participation, even in the simple case where someone has a problem, types their problem into a search engine, and finds a previous exchange on an Internet forum that provides a solution to the problem. However, where the question is less closely defined, such searches easily lead not only to vicarious participation in other people's past exchanges, but also to becoming drawn into participation in shared inquiry or a shared construction on the Internet. This new form of open community dialogue expands across space and time in a different way from previous forms. Each question goes out to an unknown horizon. Each response comes back from that horizon giving the 'community' an apparent concrete form when really it is as nebulous in form as a cloud of electrons. Because there are no fixed boundaries on the Internet, ultimately the community being dialogued with in this way is the whole of the Internet.

The Internet gives an apparently concrete form to Buber's notion of dialogue with the 'Eternal Thou' if we translate this as the 'Infinite Other'—or that other that calls us out into dialogue but that cannot be contained or understood by us as an 'It' but is always beyond us as a 'Thou' (Wegerif 2013). However, much dialogue on the Internet is rather less satisfactory than Buber's account of dialogue with the Eternal Thou. The Internet raises new challenges which reduce to a failure to use it as a way of engaging in dialogue for shared inquiry and increased mutual understanding. Hansson (2007) describes how web-based mediation can make it harder for students to enter into genuine relations. Potentially, this may be due to a tendency to objectify others or because 'genuine encounters' are not happening appropriately. Such concerns could be addressed by education. One of the criticisms of the Internet's effects on thinking made by Carr (2011) and others is that it leads to distraction and superficiality. Teaching children and young people how to critically examine information, how to ask good questions that will make the best of the vast resources of the Internet, and how to work together to deepen shared inquiry, is an educational response to the needs of the new Internet Age (Wegerif 2013).

One model by which education could work with the Internet to expand dialogic space is as follows. It is not unreasonable to claim that communications technologies influence education, after all, the very first schools in ancient Sumeria were set up to master the complex new technology of writing. As we considered previously, education into the dialogue of humanity described by Oakeshott (1959) only works if there is global literacy. Therefore, in a similar way, we may need a universal education into how to think together effectively with the Internet if we are to realise its potential (Wegerif 2017a).

The Internet as a whole has the potential to be a vast intelligence combining human and machine thinking. It does not represent a network of separate AIs, but it is, or at least could become, one distributed collective intelligence (Lévy 1997). The kind of intelligence dialogic education promotes first of all is what Dewey considered 'social intelligence' (Giles and Eyler 1994). This is about the capacity of a society as a whole to think together, learn together and respond appropriately to challenges. Increasingly the Internet leads us all to inhabit a global social context, and it is possible that dialogic education is one way to respond collectively to the many challenges that this raises.

6 Conclusion: the restoration

We began this article with an illustration of Buber's idea that man is twofold. When Merleau-Ponty could not understand the speech of a taxi driver in Manchester he said to himself 'those are words there'. Normally, he realised, he did not notice the words that carried the voices of others but went straight through to inhabiting a shared world of meaning. It is common now to experience technology as something other than human and, indeed, as a threat to humanity. In some of his later writings Buber himself raised the spectre of technology as a 'Golem', a creation of man that turns against its creator:

> "Man is no longer able to master the world which he himself brought about: it is becoming stronger than he is, it is winning free of him, it confronts him in an almost elemental independence, and he no longer knows the word which could subdue and render harmless the golem he has created ... Man faced the terrible

fact that he was the father of demons whose master he could not become" (Buber 1947, pp. 157–158).

However, as we have seen, digital technology is an extension of us, a reified part of our language. Simondon (1958, 2001) has argued that it is in the nature of technology to create globalising systems. We see this logic of technology working out today in the emerging internet of things such that here are no truly separate AIs, there is increasingly only one AI and it is a globalised and globalising network that already includes us. Of course, there are many reasons why individuals and groups might feel alienated from this growing new order. It can be used, and is being used, to serve the interests of some over the interests of others. The challenge that we face, therefore, is how to re-incorporate the apparent alienness of technology into an expanded dialogue. This means we must consider how to expand what it means to be us, or to be human, in a way that incorporates the global human–machine network that we have created. This is an educational challenge. In the print age, education satisfied itself with inducting people into the world of books. To study a subject at university was to 'read' that subject. According to Oakeshott, to become educated in this way was to become fully human by incorporating a culture. Now, perhaps, education has the further challenge of incorporating newcomers into the machine–human network that could be called an emergent global intelligence.

While Buber's account of the twofold nature of dialogue between I-Thou and I-It helps us to understand this situation, there is also a sense in which Buber mystified our situation by ignoring the real nature and importance of technology. For Buber dialogue was not technologically mediated. It was something human, the essence of humanity in fact. Technology, for Buber, is treated merely as a tool that humans use to achieve their ends, and has nothing to do with enabling dialogue. This is perhaps understandable in the age before the Internet, but the advent of new communications technologies has enabled us to reflect back on the ubiquitous and necessary role of technology, words and other materially instantiated sign systems, in mediating dialogue. For that reason, Buber did not understand the process whereby technology has expanded dialogic space in the past and can continue to do so.

Just as writing has proved not to be a fake intelligence opposed to humanity but an extension of human intelligence, so AI may prove to be, in Centaur mode, an extension of human intelligence and not a threat to it [a vision more akin to the early visions of computing that were concerned with extending the potential of the human mind, e.g., Bush (1945) and Licklider (1960)]. However, this requires an enormous expansion of dialogic space to incorporate not only the voices of marginalised humans but also the voices of marginalised and objectified machines, which in turn requires that we engage both more insightfully and more respectfully with technology.

Certainly, there is a crisis in relation with technology. We have argued that applying Buber helps us understand the nature of that crisis and also leads to a suggestion as to how education could help to resolve it through the expansion of dialogic space. The global human–machine intelligent network that is emerging around us is not only an 'other' or a 'golem' opposed to humanity but is also perhaps our potential to be more fully human by becoming something more than what was previously thought of as a limit for the human. The very real threat that humanity is dominated by technology can potentially be turned to opportunity through education. Such education would draw young people into constructive relationships with technology (for instance, by making use of the ontological ambivalence of machines referred to earlier), in addition to inducting them into the use of global networks that enable people to think effectively together with the support of (un-dominating) machines.

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