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Section Introduction: Dialogic Education and digital technology

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The chapters in this section of the book focus specifically on dialogic education and digital technology. To frame this chapter, it is important to understand why there should be mutual interest among those who are interested in the role of dialogic approaches, and the role of digital technologies in learning. At weakest such shared theorising is important simply because technology is increasingly available (indeed, pervasive) in our everyday lives and classrooms. In this view, technologies are more or less neutral actors to be leveraged as we wish; we should thus understand how to develop dialogic approaches in this emerging context.

However, while of course rapid technological change creates an imperative to understand the impact of that change, this narrow perspective is a view that sociocultural researchers and those interested in dialogic approaches would reject. A somewhat stronger claim, then, and one that is made explicitly by Major and Warwick (this section) is that those who are interested in dialogic approaches to learning should be interested in digital technologies with respect to the *affordances* or *possibilities for action* that those technologies create for dialogue. A corollary, then, is that those interested in digital technologies should be interested in how they might develop and research tools that create or embody such affordances for dialogue and learning.

Within this context, digital tools can be seen as affording opportunity to, for example, make learning visible to students and teachers as an artefact for reflection and improvement, creating sharing space to scrutinise ideas, and showing how ideas evolve over time. Moreover, as Major and Warwick note, we care not only about the action possibilities, but also the enacted affordances for dialogue – i.e., the specific ways in which the action possibilities are implicated in promotion of dialogic interaction for learning, and indeed, as Rasmussen et al note, the ways that new tools provide both new affordances (or possibilities) and obstacles.

However, a stronger claim again is that we should be interested in the relationships between dialogic approaches to learning, and digital technologies for learning, because dialogue is both shaped by digital technologies, and helps to shape both the use and emergence of those technologies. That is, to use the language of Major and Warwick, in addition to technology creating affordances for dialogue, dialogue also creates affordances for particular uses of technology; the two are thus in mutually constitutive interaction.

Put another way, Kumpulainen, Rajala, and Kajamaa (this section) distinguish material-dialogic spaces in which the focus is (1) *about* artefacts of digital technologies – i.e., dialogue centred on digital technology; (2) *around* digital technologies – i.e., dialogue that is in the context of these technologies, a context which is expanded by the very use of those digital technologies, through their affordances for dialogue; and (3) *with* or *through* digital technologies, which might be characterised in terms of meaning that is mutually constituted in and through the dialogue and materiality of the digital technologies. Each of these perspectives can be seen in the chapters in this section of the handbook, each with important implications for how we understand and foster dialogue approaches, and digital technologies, for learning.

Chapters in This Section

The affordances – or possibilities for action – of digital technologies for dialogic approaches are the focus of Major and Warwick's contribution. The authors first provide an overview of a recent review

of the interactions between classroom dialogue and digital technology, unpacking the significance of the notion of 'affordances' for our understanding of digital technology. They briefly discuss the kinds of affordances identified in the literature on classroom dialogue and digital technology, before introducing an extended exemplification in their discussion of the microblogging tool TalkWall.

TalkWall is also the focus of Rasmussen, Amundrud and Ludvigsen's contribution, in which they highlight the way that new technologies bring both new possibilities and constraints to interaction. As the authors note, technologies can change the nature of communication. The ways that the ground rules – the rules that people make to manage interactions in particular situations – emerge is influenced by context, and in this case, the design or affordances of a technology, and the context of its wider use. As such, where technologies – such as social media tools – have established modes of use, these practices may influence the emergence of ground rules in learning contexts.

Indeed, focusing on collaborative creativity, Pifarré notes the way that digital technologies can provide a particular kind of medium and set of artefacts that shapes our thinking. Using examples from secondary education, Pifarré discusses the ways that technologies can make visible and 'tangible' dialogic spaces, with the technologies affording opportunities for co-creativity through physical manipulations of artefacts, the representation of ideas in the form of these artefacts, and relationship building with collaborators through the experience of working with shared artefacts.

In Kumpulainen Rajala, and Kajamaa's terms, this interactivity comes about because of the ways that technologies provide material artefacts that become 'social objects'. These 'social objects' emerge from the way that material objects – in this example, those created in secondary education maker spaces – are integrated into dialogic learning contexts. The authors discuss the range of ways that dialogue is oriented *about, around, and with,* these material objects for dialogic learning.

Of course, a key affordance of digital technologies for dialogic learning is that by making visible dialogue and material artefacts to learners and educators, the technologies also gather and store such data for further analysis and reflection. This affordance is the subject of Trausan-Matu's contribution, which discusses the ways that technology can help us to analyse dialogic learning, and support it. Trausan-Matu highlights the polyphonic characteristic of dialogic learning; its coherence, and diversity, and the need for inter-animation of voices to create this polyphony. In discussing how we might use computational tools to analyse polyphony in learning data, the author highlights four key considerations: (1) how do ideas – expressed through shared language, such as repeated phrases – appear and reappear throughout a dialogue; (2) how do these ideas explicitly and implicitly refer to previous parts of the dialogue, both over time (the way we repeat key phrases), and across voices (the way we bring multiple ideas together), (3) how we look for voices to converge, without conflict, or to diverge potentially to create new ideas; (4) and how ideas are inter-animated, debated across voices, to create convergence.

The affordances of a key technology – Knowledge Forum – to support these processes and their analysis is a focus of Chan, Tong and van Aalst's contribution. The authors highlight the significant potential of kinds of knowledge creation or knowledge Building (Scardamalia & Bereiter, 2014) in not only critiquing arguments and engaging with other's ideas, but in collectively creating new knowledge. As in Trausan-Matu's contribution, the role of the technology as both a site for the dialogic, and its analytic potential, are highlighted, as well as their pedagogic implementation in classrooms, to create the environment for knowledge building.

Such interactions appear particularly significant in a context where the role of technology in democracies is increasingly under the spotlight. The potential of CSCL technologies to foster

democratic participation is the focus of Slakmon and Schwarz's contribution. They draw attention to the important questions of: who participates in representation or governance (and how; whether as rulers or ruled); how they participate in these practices; and how practices are seen as legitimate governance or otherwise. As the authors note, dialogic approaches are fundamental to such questions, they concern how people engage on issues about which they may have no formal training, with people who may disagree with them, to develop civic participation. They thus argue for the potential of democratization with CSCL, to develop civic participation.

Similarly, Kleine Staarman and Ametller foreground the potential of dialogic uses of digital technologies beyond the classroom environment. In their contribution the authors note that technology can support students in making connections between their formal and informal learning experiences, with teachers, to develop shared understanding, and a learning trajectory. In this view, dialogue isn't just about exchange, but about the way that language is used relationally, and the ways that technology can reshape these practices, where technology is used not only to support activity, but where activity occurs because of ('invoked by') the technology.

The potential of such pedagogical link building is particularly significant in the context of connections between formal learning and workplace contexts, as Igorio, Amenduni, and McLay discuss, drawing on examples from higher education. In their contribution the role of technology, identity, group work, and 'trialogicical objects' is discussed, to highlight how collaboratively created objects can support and structure interactions, to become boundary-objects, that are designed by one community (here, university students), for us by another (here, e-learning customers). Identity and practice are key to understanding dialogue and technology use in this approach to understand how we position ourselves. This positioning occurs in the context of – dialogue and technology mediated – experiences such as those at university and professional practice, and these experiences impact on how we position ourselves with respect to communities.

Directions in Dialogic Education and Digital Technology

The contributions in this section foreground for the reader both the strong lineage of work around dialogic approaches to learning, and digital technologies, and the 'state of the art' in that space. The role of technology and its potential in dialogic approaches is foregrounded, with clear illustrations from a range of technologies and pedagogic contexts. The chapters here provide an important overview, drawn from the myriad of work that explicitly or implicitly draws together digital technology and dialogic approaches for learning.

For some kinds of technologies, these affordances for dialogue have been of longstanding interest to those working on dialogic approaches. For example, in a recent editorial (Stahl, Cress, Ludvigsen, & Law, 2014) the dialogic foundations of CSCL are drawn out, highlighting the strong philosophical ties, and their relationship to the specific CSCL environments described in the issue. Other kinds of technology, though, have been less well explored in the context of dialogic learning. The chapters in this section touch on some of these technologies. Future work should investigate relationships of dialogic learning and tools such as 3D printers, which make possible the quick physical manifestation of idea building that embodies co-constructed thinking, to act as artefacts for that thinking to be improved through physical re-representations, mediated by the functional capacities of the 3d printing technologies. That is, the ways that technologies provide material improvable objects (Twiner, 2011) for thinking dialogically through the ways that they represent and re-represent.

Even tools with longstanding histories in learning contexts are now being investigated in novel ways. A body of work, exemplified by Trausan-Matu's contribution to this section, is investigating the role that technology has not only in fostering dialogic learning, but in understanding it and adapting to it.

A number of recent pieces have discussed how discourse based computational analytics might be grounded in learning theory, to support learning (Clarke, Resnick, & Rose, 2018; Knight & Littleton, 2016). Such analysis also opens up the potential to develop new lines of research into dialogic learning, and new tools to support that learning, such as 'chat agents' that are trained to engage students in dialogue, or to act as an agent in group collaboration (for example, Kumar, Rosé, Wang, Joshi, & Robinson, n.d.)

Indeed, these applications are being developed across the kinds of context discussed in this section. For example, a new computational approach to understanding the development of dialogue that aligns with a community of practice called epistemic network analysis (grounded in 'quantitative ethnography') has been used to analyse both dialogically informed classroom activity (for example, Knight, Arastoopour, Williamson Shaffer, Buckingham Shum, & Littleton, 2014), and professional activity conducted within a 'virtual internship' (Shaffer, 2017; Shaffer et al., 2009). Indeed, game based and dialogic learning has also shown promise in supporting areas such as citizenship education (for example, Chee, Mehrotra, & Liu, 2013).

Bringing together digital technologies and dialogic approaches to learning holds great potential. This potential will be particularly fulfilled with approaches that recognise the mutually constitutive interaction of dialogic approaches and digital technologies, to support and shape learning. As the chapters in this section highlight, there is clear potential, and a need for further research, regarding the role of different kinds of technologies, and the potential to analyse new kinds of data to gain insight into learning, and use that analysis to develop new technologies and supports. Such work should occur both within formal educational settings, and – as the contributions to this section make clear – across formal and informal settings, and in wider civic society. Such a wide-reaching approach would make use of the potentials afforded by pervasive technological access, and build on the fundamental theoretical underpinnings of dialogic approaches as a way to understand the world.

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