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Journal Item

How to cite:

Littleton, Karen and Wegerif, Rupert (2003). Editorial - Introduction to the special issue on deliberation with computers: exploring the distinctive contribution of new technologies to collaborative thinking and learning. *International Journal of Educational Research*, 39(8) pp. 787–791.

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Version: Accepted Manuscript

Link(s) to article on publisher's website:
<http://dx.doi.org/doi:10.1016/j.ijer.2004.11.001>

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Deliberation with computers: Exploring the distinctive contribution of new technologies to collaborative thinking and learning.

A special issue of the International Journal of Educational Research

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Editorial introduction: Exploring the distinctive contribution of new technologies to collaborative thinking and learning.

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Since the advent of computer technology there have been debates and discussions concerning what the computer has to offer as a technology for supporting education. Some researchers and theorists have focused on the computer's potential to support individualised instruction. In practice, however, computers in educational settings, particularly schools, are frequently used to support collaborative work and foster interaction between learners (Wegerif & Scrimshaw, 1997). Furthermore, there appears to be a positive belief on the part of teachers and tutors that interacting around or interacting via the computer can be a particularly productive way of learning:

‘it is widely held that some of the clearest benefits of educational computer use arise from the fact that they lend themselves so well to collaborative modes of use’

(Crook, 1994, cited in Light & Littleton, 1999).

There is also a good deal of research evidence to support this proposition (for reviews see Littleton & Light, 1999; Dillenbourg, 1999). In a wide range of situations involving

working with computers, pairs or small groups of learners not only appear to perform tasks better than individuals, but also to learn more from doing so. This is true even of types of software developed specifically for individual use, such as ‘drill and practice’ software, Intelligent Tutoring Systems and Integrated Learning Systems (Light & Littleton, 1999).

The papers and brief research notes (which document work at an early stage of development) presented in this Special Issue highlight a diverse range of perspectives on the related issues of what constitutes collaboration and the bases of intellectually productive interaction. Many of the studies presented involve in-depth qualitative analyses of spoken and written discourse, derived from the intensive study of collaborators engaged in computer-mediated joint activities. Whilst in many instances the numbers of pairs or small groups studied are small, the work reported here nevertheless constitutes a valuable and much needed line of inquiry raising, through the presentation of detailed analytic work, important issues concerning the distinctive contribution of information and communications technology (ICT) to collaborative thinking and learning. Not surprisingly, the different contributions present diverse ‘takes’ on this issue.

The opening contribution by Kumpulainen, Vasama and Kangassalo, suggests that, inquiry-based early years science learning activities are *enriched* by technological resources that *support* children’s social interaction and explanation construction about scientific phenomena. The authors suggest that inquiry-based science learning activities, based on child-initiation and the application of technological tools, can create a fruitful setting for children to construct explanations. In the work reported here, it was the social sharing and investigation of technological resources, along with the engagement in hands-on explorations, that enabled the children to go back and forth between a variety of intertextually rich explanations that were based on different types of contextual knowledge, including everyday and scientific registers.

The issue of intertextuality in discussion and explanation also emerges in the paper by Staarman, Aarnoutse and Verhoeven. These authors investigate the multi-modal discourses which take place in a primary school computer-supported literacy environment, in which face to face talk in pairs is combined with computer-mediated communication. Through their analysis of the different inter-textual references made by

the children, the authors describe the reflexive nature and value of students' talk in computer-supported collaborative learning environments.

The role of Initiation, Response Feedback (IRF) exchange, the so-called 'essential teaching exchange' (Edwards & Westgate, 1994), in the discursive dynamics of e-mail tutored interactions is explored in Giordan's contribution. Analysing a tutoring service offered by a Brazilian scientific society to both primary and secondary students, Giordan argues that he provides evidence of the 'potentially subversive' character of the interactions performed by students and teachers in terms of the structure of tutorial activities. A distinctive and valuable feature of the collaboration between tutor and student arising through the activity of tutoring through internet services, he argues, is to encourage the student *to initiate the interaction* which changes the structure of the IRF exchanges. As Giordan explains this: 'allows the student to propose the agenda for the interaction, in which lies a real opportunity to consider students' needs expressed in their own voices'.

Also pointing to the limitations of the prevailing IRF pattern of classroom dialogue, de Vries and van der Meij note that dialogues structured according to the IRF pattern of discourse provide few opportunities for students: 'to use narration as a central mode of thinking'. Drawing on analyses of e-mail exchanges between primary school children de Vries and van der Meij discuss the value of e-mail in supporting *reflective narration*, arguing that e-mail can serve a meaningful function in a narrative curriculum aimed at experiential enquiry. Structural descriptions of teaching-learning interactions such as the IRF are also problematised in the paper by Ramussen, Krangle and Ludvigsen. These contributors' analyses of secondary school students' interactions in two technology rich learning environment illustrate how two different learning environments can provide *concrete conditions for the interpretative process of understanding a school task*. Thus in these situations computer technology can resource the active process of interpreting and re-interpreting the 'given task', and constructing such joint understanding is crucial if collaborative work is to be educationally productive.

The contribution by Wegerif, Littleton and Jones illustrate three ways in which computers can resource collaboration between peers. First, they point to the value of the computer in supporting Initiation *Discussion* Response Feedback (IDRF) exchanges, where the computer is used to *initiate discussion* and argumentation and then *respond*, directing it through using feedback. Second, they suggest that group strategy games

played against the computer can support *social cohesion* and motivate collaboration. Thirdly, the potential of forms of on-screen representation which allow children to externalise their thoughts, thereby creating a flexible support for dialogues which essentially enables dialogues to be: '*objectified for and manipulated during shared reflection, discussion and argumentation*' is also explored. Here ICT is characterised as a medium that can usefully objectify thinking, while remaining essentially dialogic.

A word of caution regarding the use of computer-technology to support argumentation is offered by Joiner and Jones, who speculate that in some cases the dialogic context created in face-to-face discussion may provide more prompts and support to students than the context provided by computer-mediated discussion. The research note by Dillon, however, whilst recognising the value of argumentation, suggests that in some contexts researchers should be careful not to over-emphasize the role of explicit dialogue and argumentation as a basis for productive interaction. Dillon's analyses demonstrate that with open-ended face-to-face ICT-based music tasks the need to explicitly state and justify ones position is not a pre-requisite for developing a shared understanding of the task. Dillon argues that extended periods of explicit argument may not be conducive to collaborating on creative tasks. In this situation it is evident that whilst *thoughts are mediated* verbally, they may also be mediated '*musically, non-verbally and via the computer through actions and explicit manipulation of the compositional structure*, which can be performed without engaging in extended verbal reasoning.'

Two of the contributions stress the impact of ICT-based collaborative teaching-learning practices for 'socialised subjectivity' and identity-work. Gillen's exploration of doctoral students' use of an electronic bulletin board remind us that: 'mastery of a new literacy practice for both students and tutors involves not merely cognitive learning or the narrowly defined acquisition of technical skills...but more crucially, participation in the communities/cultures which give meaning to the particular practice (Wegerif, 1998). Thus, these new literacy practices have an impact on the professional/personal identity of tutors and students including the maintenance or negotiation of status.' The research note from Del-Castillo, Garcia-Varela and Lacasa further emphasises how collective attempts to reach a shared goal, in this case the creation of a web-site, involves more than intellectual engagement with the task. The authors' qualitative analyses of a group of 12-13 year-olds engaged in constructing a web-site also reveal that the processes

involved in the creation of the web-site are inextricably interwoven with the creation and negotiation of a shared identity, as members of a particular community of practice.

Information and communications technologies are diverse and yet it is possible to write about shared features which distinguish them from other educational resources. Loveless (2003) sums up these distinctive features as: 'provisionality, interactivity, capacity, range, speed and automatic functions'. The papers in this collection offer many insights into how these distinctive features can be seen as 'affordances' (Laurillard, 1993) which support collaborative thinking and learning in different educational contexts. For instance, the student-initiated (and led) teaching and learning exchanges reported by Giordan are rare in face-to-face classrooms but are afforded by the capacity of ICT to support asynchronous dialogues at a distance. Similarly the geographically dispersed students in Gillen's study have the opportunity to become socialised into the practices and subjectivity required of reflective professionals and it is the scope of ICT coupled with the interactivity that makes this possible. The intertextuality reported on in several papers is also a particular affordance and one which relates to the capacity of ICT to support multiple forms of representation. The example of Bubble Dialogue given by Wegerif, Littleton and Jones illustrates how provisionality, the capacity to revise and adapt a representation of the shared dialogue, can give the computer a distinctive role in resourcing reflection. This same issue arises in the article by Gillen where computer-based representations are shown to be at the same time objective enough to be shared objects of reflection and flexible enough to support changes in shared thought and identity. In this sense computer-supported dialogues mediate between the fixed objectivity of traditional print and the ephemeral nature of face-to-face conversation. Several papers also highlight how the distinctive ways in which computers enter into the social relations of a group can help them to support collaborative thinking and learning. In the paper by De Vries and Van De Meij the computer serves as a stimulus and focus for group narrative reflection. Wegerif, Littleton and Jones discuss ways in which the ambivalent status of computers as both subject-like and object-like allow them to support group thinking. For example, the fact that computers can interact like a real opponent in a strategy game combined with the fact that they do not 'mind' losing allows children to learn through motivating competitive games that enhance both small group identity and classroom solidarity. In

all these and other ways distinctive affordances of the technology are shown to have an impact on the educational quality of activities.

However, it is also clear from the papers presented in this collection that teachers and tutors have a pivotal role to play in integrating and contextualising the experience of working and talking together using a computer within the larger ongoing process of the guided construction of knowledge. Computers can and do enter into, and distinctively shape and support educational dialogues. However, it is important to recognise the significance of the wider pedagogic framework within which particular collaborative computer-activities are situated and framed.

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