EXECUTIVE SUMMARY

This article reports how university researchers and teachers worked together to analyze and develop dialogic teaching and to jointly reformulate existing notions of classroom dialogue by incorporating technology use. It describes how we refined an innovative methodology involving equitable collaboration between university researchers and classroom practitioners in building and refining theory together (Hennessy & Deaney, 2009a). Our approach draws on previous studies of “reciprocal partnership,” “co-learning” and “co-inquiry” with practitioners that respect the teacher’s ‘voice’ and expertise as complementary to those of academics and deliberately exploit them in order to question, understand and improve practice. These studies and our own also offer sustained support or stimulus from external colleagues and aim for close integration of theory and practice. Finally, we draw on research using analysis of digital video recordings of classroom activity to help make explicit teachers’ underlying pedagogical rationale and routine practices.

Our overall aim was to work together to analyze and develop theory and practice concerning classroom dialogue – where teachers and students exchange, evaluate and build on each other’s ideas and make their reasoning explicit – in the context of using the interactive whiteboard (IWB). The IWB offers new opportunities for dialogue in which students physically contribute their own ideas and a class can construct new knowledge together. The process of co-inquiry itself is our focus in this paper, rather than any substantive findings. The process involved jointly assessing the utility of theory and practical guidelines derived from research in the area of dialogue and using relevant aspects of these to inform thinking, to develop new teaching practices and to recontextualize and refine the theory itself.

A case study approach developed dialogic approaches to using the IWB in three natural settings. Participants comprised three reflective, articulate (primary, middle school, secondary) teachers who had integrated IWB use and dialogic teaching into everyday practice. The teachers participated in five intensive workshops designed to raise further their awareness of the nature and functions of classroom dialogue. The workshop series comprised three days within 2 weeks, then two half days within 7 months. We employed a range of stimuli, including research literature and video exemplars of IWB use derived from pilot filming of participants and from other practitioners taking part in our prior research. Participants critiqued illustrated approaches, then designed and implemented short modules (3 lessons) of IWB-supported dialogic teaching. Topics included personal safety, crime story writing and trench warfare. These lessons were video recorded. Three interviews were conducted with each teacher and unstructured diaries recorded their reflections on lessons and workshop discussions. ‘Critical episodes’ were then selected independently by teacher and researcher pairs and jointly evaluated in terms of how IWB use supports dialogue. This was followed by cross-case thematic coding of text documents including interview and workshop transcripts, follow-up questionnaires and accreditation reports using HyperResearch™ software. This analysis characterized teacher perspectives on the reflexive co-inquiry process and its outcomes.

The process of engaging respectfully with each other’s perspectives and practices was itself dialogic. We drew on and debated conceptualizations of dialogue within the literature and arising from our workshop and post-observation discussions of the practices we viewed. Multiple perspectives and interpretations were made
visible, debated, systematically tested, refined and extended. The research extended the methodology of our previous research (Hennessy & Deaney, 2009a) in some significant ways. The theory building process benefited greatly from: critique of carefully selected stimuli; deep reflection within teacher diaries; iterative representation of our thinking about developing strategies already embedded in practice. It included fruitful interchange between teachers of different subjects and primary/secondary phases.

The process again brought together the scholarly knowledge of university researchers derived from existing theory, research findings and experience, with expert teachers’ practical theories or perspectives on how technology supports learning, and their extensive, professional craft knowledge: that is, tacit knowledge arising from and in turn informing everyday practice. Each of the participants played a unique contributory role in this process of joint reflection on specific classroom experiences, and their representation and understanding in new, grounded ways. In this way “intermediate theory” – bridging between teachers’ perspectives on supporting learning in specific settings and key theoretical constructs – was co-constructed by the teachers and university research team. The process is illustrated in detail in the paper through analysis of selected workshop and meeting transcripts.

In this study intermediate theory was embodied within a collaboratively generated table summarising the conditions, typical activities and goals of dialogic classrooms in which the IWB was used, and a further table listing teacher strategies for supporting dialogue (including multimodal forms) in this context. The co-inquiry thereby extracted from the complexity of authentic practice some key characteristics of IWB-supported dialogue and dialogic pedagogy. It yielded democratically negotiated, enriched understandings of the theoretical ideas, framed in a common accessible language. This flexible framework and the practices developed were spontaneously adapted and exploited for wider use in each school.

Outcomes also included a ‘teacher-friendly’ version of the dialogue table, using headings ‘In my classroom, we:’, ‘You will see us:’ and ‘So that we can:’ and a sample Teaching and Learning Policy Action Plan, outlining one teacher’s proposals for staff development in her school. Along with our illustrative examples of teacher practices, these materials form a springboard for further critique and modification in other settings, subject areas, and with different student groups. Finally, preconditions, critical features and scaleable benefits of our evolving approach have been identified for other research partnerships. Again these offer not models for replication per se, but rather a potential stimulus for reflective thinking upon existing practices.

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INTRODUCTION

Extending a line of inquiry into an equitable researcher–practitioner collaboration in “deconstructing” classroom practice, the study reported here involved university researchers and teachers working together to analyze and develop dialogic teaching, and to jointly reformulate existing notions of classroom dialogue by incorporating technology use.

Previous studies of “reciprocal partnership” and “co-inquiry” with practitioners characteristically: (a) respect the teacher’s ‘voice’ and often untapped and undervalued expertise (Elden, 1981; Fisler & Firestone, 2006; McLaughlin, Black-Hawkins, Brindley, McIntyre, & Taber, 2006; Rathgen, 2006), (b) offer sustained support or stimulus from external colleagues (Jaworski, 2006), and (c) aim for close integration of theory and practice (Baumfield & Butterworth, 2007). Approaches with similar ethos are the interactive ‘co-learning’ partnerships described by Wagner (1997) and Edwards and Jones (2003), in which university researchers and practitioners are both agents and objects of systematic and reflexive inquiry, as well as Baumfield and Butterworth’s (2007) analysis of “what is exchanged” across 12 years of research partnership work. Their outcomes included increased access to student feedback and new pedagogical strategies leading to co-authored and independent teacher publications.
Drawing on these studies, we developed an approach to collaborating with practitioners in intensive critical scrutiny of practice, in which our differing professional expertise was valued and deliberately exploited. This approach resonates with the “project community of inquiry” described by Jaworski (Bjuland & Jaworski, 2009; Jaworski, 2006, 2007), in which teachers and academic researchers take complementary roles in co-inquiry within a culture of mutual respect and responsibility. Both maximize their learning opportunities, and their alignment within the community becomes critical and questioning of practice. Our own model of co-inquiry was defined as: together making sense, analyzing and reflecting, and investigating through research; then making the outcomes publicly available for further scrutiny. At the outset we formulated a set of guidelines for our interactions with teachers, stating that as researchers we would:

1) maintain an equilibrium between teacher and researcher perspectives and priorities, and acknowledge the potential danger of teacher politeness or superficial acquiescence to perceived expectations;
2) build teachers’ security to share their own perspectives and practices, and to freely offer constructive criticism of other approaches; use open-ended questioning to invite alternative opinions and conjectures;
3) orchestrate team discussions carefully, especially by recognizing, rephrasing, recording and recirculating key ideas emerging, and aligning participants with respect to those ideas and to each other.

The particular practice we focused on was the use of the interactive whiteboard (IWB) to promote active student participation in classroom dialogue. Taking a sociocultural perspective, we examined how digital artefacts are collectively constructed on the interactive whiteboard (IWB) through rich and complex interactions in which a range of resources (graphic, textual, photographic, audio and video) are manipulated, annotated, revisited, interpreted and continually modified in conjunction with classroom talk.

The research schedule began with three full-day workshops in which teachers prepared to design and teach three consecutive lessons employing a dialogic approach supported by IWB use. Their lessons were videoed. In two follow-up half-day workshops, teacher and university researcher pairs jointly reviewed the lesson videos along with unstructured teacher diaries, interviews (3/teacher) plus other contextualizing data. Finally, the university researchers conducted cross-case analysis of the data including interview and workshop transcripts, follow-up questionnaires and accreditation reports in order to characterize teacher perspectives on the reflexive co-inquiry process (itself dialogic) and its outcomes.

The main focus of this paper is on describing how we further developed an evolving methodology of co-inquiry, and on the participants’ experiences of the process. The themes discussed are the vehicle through which we make our methodological journey, but the discussion emphasizes our dialogic approach, how the research collaboration progressed, and the kinds of outcomes it produced.

Before describing the main features of our methodology, we introduce the key concepts of ‘intermediate theory’ and ‘dialogic interaction’.

**Key concepts**

**Intermediate theory building**

“Practice serves theory as much as theory serves practice.”

(Randi & Corno, 2007, p.338)

A central and innovative feature of our study is our collaborative approach to *building theory with teachers* about pedagogical strategies – in this case, strategies that underlie their use of technology in the classroom. We draw on the idea of an “intermediate theoretical scope”: that bridges specific setting (practice) and grand theory, specifying conditions in which theory applies (Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003; diSessa, 1991). Thus, what we have termed *intermediate theory* is developed through bringing scholarly knowledge (derived from educational theory plus empirical research findings) into dialogue with articulated accounts of what we call *applied practical theory.*’ This second type of knowledge is derived from experienced teachers’ situated perspectives (Deaney, Ruthven, & Hennessy, 2006) and their tacit, intuitive
the importance of explanation and justification of ideas. Examining and developing this role was the teacher's role is critical in sustaining ideas can be tried out before being finalized (Kershner, 2008). Littleton, Mercer, & Twiner, 2007; S. Hennessy, Deaney, Ru

perceived benefits, suggestive of action) of IWB technology interaction.

A significant strength of the IWB technology lies in its potential to support the collective and visible expression and evaluation of learners’ ideas, and thus the co-construction of new knowledge during interactive whole-class teaching. It thereby lends itself to supporting dialogic classroom interaction.

Our project built on our previous observations of how some reflective practitioners harness the affordances (perceived benefits, suggestive of action) of IWB technology more than others (Gillen, Kleine Staarman, Littleton, Mercer, & Twiner, 2007; S. Hennessy, Deaney, Ruthven, & Winterbottom, 2007; Warwick & Kershner, 2008). These affordances include provisionality (objects on the board are easily modified so that ideas can be tried out before being finalized), interactivity (direct manipulation of objects), and multimodality (multiple communicative modes). Together they increase the opportunity for teachers to create space, time and status for learner contributions, and to challenge thinking by exploring different perspectives. The teacher’s role is critical in sustaining dialogue around these multimodal representations and in making explicit the importance of explanation and justification of ideas. Examining and developing this role was the
substantive focus of our wider project, with its central question: *How can practitioners with an established dialogic approach to teaching exploit the IWB technology to support student learning?*

The goal of the research was to engage teacher participants in reflecting on, making explicit and developing their own dialogic practice. This was to involve (a) deliberating on the underlying issues and principles, (b) debating the merits and limitations of both conventional representations of dialogue and others’ documented classroom practices, and discussing their adaptability to participants’ unique contexts, and (c) designing, implementing and critically evaluating creative pedagogical strategies that support teacher–student and student–student dialogue using the IWB.

Recognizing that synthesizing research-based knowledge with teachers’ craft knowledge demands “time, energy and helpful procedures” (McIntyre, 2005, p.362), our four aims were:

1) to develop an evolving methodology for equitable research collaboration with teachers by incorporating some new stimuli and “helpful procedures”;

2) to undertake a workshop-based process of intermediate theory building and video analysis aimed at co-constructing and documenting a research-informed perspective on dialogue and dialogic pedagogy in the context of IWB use;

3) to solicit teacher perspectives on the theory building and on other aspects of the co-inquiry process and its outcomes for them;

4) to reflect from a university-researcher perspective on the dynamics, methods and scalability of the collaborative theory building process, and on how its outcomes might be shared more widely.

**Developing a methodology for research collaboration**

The primary goal for the project was to develop as well as to analyze and document classroom practice, focusing on strategies for orchestrating dialogue in the context of IWB use. We set out to extend our previous methodology in several ways (Aim 1). A central feature was the use of workshops in which resources, especially video, were used to stimulate the reflective dialogue that formed the basis of our research partnership. The workshops served the dual purpose of professional development (for both teachers and university researchers) and data collection, helping us to make explicit and capture our collective thinking as it developed.

**Intermediate theory-building workshops**

An intermediate theory of dialogic teaching involving IWB for whole-class settings was developed through workshops that included sharing, questioning and recontextualizing established notions of dialogue and dialogic pedagogy. Beginning in the first workshop, the team co-constructed a descriptive framework with the aim of reconciling some of the variation in use of these terms in the literature, and translating this into language that other teachers could access. This crucial modification to our previous methodology continued throughout the project as a dialogic cycle of exchange in which the scholarly knowledge being examined was not only synthesized and reformulated but also “activated within teaching” (Ruthven, 2002, p.596).

The workshops were conducted away from school sites (at the university), a strategy that “affords [teachers] the luxury of exploring ideas without worrying about what they are going to do tomorrow” (ibid., p.6). Gearing the workshop activities towards incorporating and testing new ideas in their classrooms then discussing the experiences in subsequent workshop sessions combined the advantages of working in both settings. Because our case study teachers were reasonably confident using a dialogic approach, they were able to engage with the literature and other stimuli and to bring their own professional knowledge to bear.

Our procedure for introducing theory in the workshops combined (a) distribution of occasional short readings (detailed in Table 1), mainly for reference rather than as “assignments” as we could not expect teachers to read lengthy academic texts; (b) some short presentations synthesizing key research; (c) informal introduction of theoretical constructs into our ongoing discussions (referring to printed resources where appropriate) at points where they seemed relevant. This was mainly during joint viewing of videos or when teachers interpreted an example of practice in a way that stimulated a link being made by a university...
researcher to familiar work. The small number of teachers permitted plenty of opportunities to discuss resources, ideas and exemplars of practice, and enabled the team to establish our degree of alignment with the constructs encountered. This process supported the progressive development of theoretical awareness and the co-construction of our own account of dialogue (rooted in practice).

We did not want to overwhelm the teachers with theory, so were selective in what we included in discussion. So, for example, we did not mention the theoretical framework of Bakhtin and Wegerif, but nevertheless brought some of their ideas (e.g. “orienting oneself to others’ perspectives”) into our presentations and discussions, and they are evident in the final account. Other ideas (e.g. “willingness to change one’s mind”) remained explicit throughout, and further initially explicit ideas (“consensus”, “dialogue” itself) became reformulated (“synthesis”, “nonverbal dialogue”) or had faded (ibid.), as elaborated in Results. Thus, the salience of original theories within the intermediate framework varied, as in examples by Ruthven et al (2009, in press), both at the point of exposure and in their use.

**Stimuli for discussion**

A critical feature of this study was grounding in educational theory and exploitation of some new stimuli before lesson observations were undertaken. We devised resources to use as springboards for discussion and subsequent lesson planning, and to try out a dialogic approach supported by technology use. (Specific resources used are listed in Table 1).

In our previous work, we employed a “toolkit” of resources to guide groups of teacher colleagues in viewing selected parts of the T-MEDIA mathematics CD-ROM. The toolkit resources acted as an external catalyst for discussion within a cycle of teacher-led collaborative professional development – through video-stimulated dialogue and critique, joint lesson planning with a common teacher-selected focus, peer observation, feedback and joint reflection. The process proved enormously stimulating and led to changes in practice at classroom and department levels (Hennessy, Deaney, Dawes, & Bowker, 2008). In the present study, we used similar resources except that the teachers did not observe each other in person but had their own lessons videoed.

The main resource was digital video exemplars of teachers integrating IWB technology into their practice. These were recordings both from participants’ own lessons and from those of teachers in prior projects (in Phases 1b, 1c and 3 below). Use of the former has proved effective in recent professional development work carried out independently by Jones et al. (2009) using ‘video-stimulated reflective dialogue’ to improve pedagogy in using technology to support dialogic teaching in mathematics and science. Use of the latter relates to work using the Interactive Classroom Explorer interface with teachers who critique digital video extracts of exemplary practice (Sorensen, Newton, & Harrison, 2006); it relates also to the toolkit study mentioned above. Both kinds of videos were used as stimuli for debate in a series of in-depth workshop (team) discussions focusing on the key construct of “dialogic interaction” that had emerged as centrally important in our previous collaborative data analyses and in the literature, and extending it to new contexts.

This “collaborative video analysis”, in which teacher–researcher teams view and discuss video together, affords rich opportunities for engagement in professional dialogue and scholarly analysis that are highly valued by practitioners as well as university researchers. It follows previous work in this field which has employed video for capturing the complexity of teaching and learning processes, to render implicit rationale, values and routine practices more explicit and allow the practices to be visualized (Armstrong & Curran, 2006; Lesh & Lehrer, 2000; Powell, Francisco, & Maher, 2003; Sorensen et al., 2006).

**Research partnership through dialogic inquiry**

We sought to achieve a truly equitable approach to co-constructing new practices, whereby the insights and reflections of all were equally important in formulating and refining theory. Our workshop procedures built on a growing body of research on successful approaches to professional development for classroom technology use: primarily those based on modeling, observing, reflecting, mentoring and peer discussion (e.g. de Freitas, Oliver, Mee, & Mayes, 2008; Miller & Glover, 2007). This work illustrates teachers’ adaptability at adapting given models to suit their own contexts. Our approach drew additionally on prominent work that devises partnerships between university researchers and teachers engaged in transforming professional knowledge together, including the InterActive Education Project (Sutherland et al., 2004; Triggs & John, 2004) and its
follow-up (Armstrong & Curran, 2006). InterActive instigated ‘subject-design initiatives’ (SDIs) – sequences of work focused on embedding technology into a small curriculum area to support learning. These were collaboratively designed by teacher–researcher pairs, informed by research evidence and theory, then implemented and evaluated in the classroom. Our study extended this approach in the various ways described above. The outcomes of the SDIs were found to vary according to the strength of the individual teachers’ pedagogy; our highly targeted sampling strategy was devised to maximize this strength.

We brought together teachers of very different subjects and across phases of schooling into a single team (another departure from both InterActive and T-MEDIA methodologies). This strategy was probably successful because it included both elements; Jaworski (2007) found that some primary (mathematics) teachers felt uncomfortable working in a group with secondary colleagues with more experience. We have observed that there are both common and distinguishing features of the pedagogic strategies that teachers draw on when using technology in different curriculum areas (e.g. Ruthven, Hennessy, & Brindley, 2004) and in different schooling phases. Our focus on dialogic teaching, an approach that we firmly believe to be generically applicable, prompted us to seek commonalities across subject areas. The situated perspective indicates that the dialogic approach will of course manifest itself in different ways according to context (Putnam & Borko, 2000); the three teachers benefited here from vicarious encounters with each other’s different classroom settings and comparisons between them, affording reflection and critical analysis that would not have been possible when acting in the setting (ibid.).

The three teachers shared a common pedagogical approach in which they held a personal investment, and had individual autonomy to plan new lessons based on that approach as it evolved through our co-inquiry. We recognized them overtly as experts in their subject domains and therefore as best equipped to assess what might work in their own classrooms. The university researchers were not experts “directing teacher learning” or offering simplistic recipes for success, but were merely familiar with literature that might apply to our co-inquirers’ classroom practices.

Similarly, we did not model dialogic teaching; we exposed all workshop participants to video exemplars of classroom practice, and decided together how dialogic the depictions were (or were not), and why. A notable departure from prior work in this field, then, is that we did not present “research-based proposals” for practice (McIntyre, 2005) other than the general remit of developing a dialogic approach. Teachers generated and tested proposals themselves from critique of the theory, exemplars of classroom teaching, and, importantly, from their personal perspectives of fit with (or adaptation to) their existing concerns, contexts and practices. Analyzing video footage from their own classrooms and sharing it with the team were vital to this process.

The iterative process of co-constructing a notion of dialogic pedagogy was in itself dialogic. It involved teachers and university researchers in cumulatively building on each other’s ideas and experiences as we reconciled theoretical concepts and ideas with evolving classroom practice and collective thinking and purposefully developed them further. A critical characteristic of our co-inquiry approach, then, was dialogic inquiry (Wells, 1999) in that dialogue is perceived as the central means through which knowledge building takes place in an authentic inquiry environment. The latter supports question posing, conjecture and innovative risk taking (Bransford & Schwartz 1999), going well beyond mere exchange of ideas. Thus we construe dialogue and inquiry as co-determined. (The nuances of the relationship between dialogue and inquiry are beyond the scope of this paper, however they are explored to some extent in a theoretical synthesis by Hennessy, in preparation).

METHOD

Participants

Three UK teachers working in natural settings across various school phase, subject, and student-group contexts took part in the case studies. All three were experienced, reflective and articulate practitioners who were each known to one of the authors, and teaching at Faculty partnership training schools. The first author of this paper had not collaborated with the two co-authors previously, so this was essentially a new research partnership between the six of us, and we evolved a new way of working for this project.
The teachers were selected on the basis of having an observable, dialogic pedagogical approach, and of using an IWB confidently (though not necessarily expertly) as an integral part of their everyday practice. They were also willing to take what Stenhouse (1975, p.156) called a “research stance”; namely, a “disposition to examine one’s own practice critically and systematically” in the interests of personal development. An orientation towards research participation has also been linked with “willingness to engage in a meaningful way with [prior] research” (Simons, Kushner, Jones, & James, 2003), another important selection criterion. The three were:

Diane (Deputy Head Teacher and Curriculum Leader with 10 years’ teaching experience) worked with primary children aged 10. She chose to focus on Personal, Social, Health and Citizenship Education (specifically, the topic of personal safety and assertiveness) for the study. Diane is a senior mentor who teaches on the Faculty’s mentoring course, where she explains how a dialogic pedagogy informs her work in developing reflective practice with student teachers. As an exemplar teacher for postgraduate observation visits, she has been seen teaching by many of our Faculty colleagues, who recommended her when we sought dialogic teachers for the project.

Caroline (Head of English with 5 years’ experience) worked with middle-school students aged 12–13, and introduced crime-story writing in her lessons. Caroline undertook her postgraduate teacher training and the “Fast Track” leadership programme at Cambridge, and was therefore subject to additional scrutiny with respect to classroom pedagogy. She has often talked in the Faculty about her pedagogical approach with student teachers and is seen by her school’s senior managers as having exemplary classroom practice. Since this study she has followed up the work by enrolling in our MEd programme (2008–10) and using her dialogic teaching as a springboard for evaluation and development of teaching in her school.

Lloyd (Head of Humanities with 18 years’ teaching experience) worked with secondary students aged 13–14, and focused on trench warfare during World War I in his history lessons. Lloyd had participated in a previous research project (Technology-Integrated Pedagogic Strategies, 2000–02) and in T-MEDIA (2005–07), where his dialogic approach was directly observed by the first author and scrutinized in depth during our thematic analysis. His school belonged to our local schools-university research partnership and he had participated in several small-scale action research projects.

The three teachers all worked in mixed-sex schools within a 25-mile radius of the city of Cambridge, UK. Our interactions over time with the schools indicated that they all had a research culture and leadership supportive of our co-inquiry, an important precondition for its success (Baumfield & Butterworth, 2007). The primary-school class was a heterogenous (“mixed ability”) grouping comprising the younger half of the year cohort. The school was in an ethnically diverse inner-city location and had levels of socioeconomic disadvantage (as indicated by entitlement to free school meals) significantly greater than the national average. The secondary school was in the same location and had average levels of disadvantage, and specialist Technology College status. The class was an (experimental) all-boys grouping within history, designated as homogenous (highest attaining of four classes). This class was deemed valuable for case study because it contained two students in the “Pupils as Learning Partners” scheme. This involved the students (incognito to peers) commenting on lessons using a diary and a lesson observation sheet that Lloyd had devised to categorize classroom interaction, focusing on dialogue. They discussed their responses with the teacher and even helped with subsequent lesson planning. The scheme was a remarkable outcome of Lloyd’s earlier discussions with colleagues about the T-MEDIA research, which subsequently received external funding.

The suburban middle school had a level of disadvantage lower than the national average, and the class contained the upper half of a year-group cohort grouped primarily in terms of attainment on a standardized writing test. The secondary and middle school classes had no students with severe special educational needs, whereas the primary class had 13/25, constituting the most challenging group that Diane had ever taught. "Value-added” standardized test data showed that students in all of the schools made good progress relative to their intake performance levels.

Knowing that carving out time to participate in this type of inquiry is a problem for busy teachers, we funded release time for all case study teachers’ research activities. We also supported (and funded) them in achieving accreditation from our Faculty via the Certificate of Educational Enquiry programme. This required them to write a 4000-word report that included reflection on inquiry processes and findings. Encouraging them to carve out and investigate an aspect of the research that they found of particular interest recognized
teachers’ prioritization of practicality in applying ideas from research (McIntyre, 2005) and increased the degree of personal ownership.

In addition to the three teachers, other participants in the research collaboration were: the students filmed (the two Learning Partners also participated in a video analysis session), three university researchers (the authors) and an expert IWB user, Chris (T-MEDIA science teacher), who provided some workshop input. A research assistant recorded and processed the audio and video data.

Data collection

The programme comprised a phased, workshop-based process, in which we progressively deconstructed existing ideas about dialogue and exemplars of existing practice. All workshops were attended by all three teachers plus at least two university researchers.

Phase 1: initial workshops

The programme began with three full-day workshops, all scheduled within a two-week period. The workshop activities and use of stimuli are summarised in Table 1.

<Table 1 here>

Phase 2: classroom lessons

Three consecutive lessons were videoed in each classroom; one researcher and our research assistant were present at each. Piloting during two familiarization lessons before each study began assisted resolution of technical issues. The teachers kept unstructured diaries recording their pre- and post-lesson reflections, observations and strategic planning. They were interviewed once about their plans (using a semi-structured schedule) and twice again after lessons (using printed prompt cards) for about an hour. IWB resource files and captured annotations, lesson plans, worksheets, digital photographs and copies of student work provided valuable additional contextualizing data. Copies of all data were circulated to the researchers and the teacher they concerned, including copies of the videos on CD.

Phase 3: video review

Two months after the end of Phase 1, the whole team reconvened for a fourth half-day workshop to review our experiences and evolving construction of dialogue. Teacher-selected video clips (and transcripts) were shared and used in generating criteria for identifying critical episodes of IWB-supported dialogue (elaborated under Results). This technique, also employed in Phase 1 with pilot videos, had been used by Armstrong and Curran (2006) because it offered greater teacher ownership over the data than is customary. Importantly, we revised our notion of critical episode after initially reviewing the videos, to include both discrete episodes of IWB use (as planned) and larger cycles of activity sustained or phased over time, agreeing that critical episodes only make sense in light of the “bigger picture” and “some lessons may be a continuous story characterized by dialogic interaction”.

Subsequent analysis and discussion of episodes (9–10 / subject case) was carried out by one university researcher (normally the one present during filming) in collaboration with the teacher (whose "insider memory of the lesson" was of major importance: Groundwater-Smith & Dadds, 2004, p. 255). Each member of the pair independently reviewed, critically reflected and commented on the three lesson videos along with diaries, interview transcripts and other data. They recorded and exchanged their thoughts and selections with precise timings, then met for 3–5 hours to compare them. Lesson videos were available on a laptop computer throughout the meetings, and transcripts of provisionally identified critical episodes were prepared beforehand. Initial impressions about episodes were (mainly) verified or aligned and elaborated through subsequent joint scrutiny, or (rarely) abandoned through consensus.

Analytic commentary took the form of a set of review notes for each case. These were created by the university researcher, who first documented the teacher’s prior pedagogical aims for promoting dialogue using the IWB (data from the planning stage Interview 1), then briefly summarized each selected episode. Both
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reviewers independently described the part played by the technology and the teacher in each chosen episode, the underlying rationale and effectiveness of the pedagogical approach in terms of quality of dialogue, and the level of student participation (cognitive or physical). These procedures were loosely based on sociocultural discourse analysis, an approach developed by Mercer (2004) and colleagues to understand participants’ own meanings within small segments of conversation through identifying key phrases signifying reasoning. This methodology was adapted to our context of technology use, where the archiving and revisiting features of the IWB technology serve to support cumulative knowledge building across as well as within critical episodes and lessons. Our analysis therefore examined connections made during extended sequences and cycles of dialogic interaction. We identified some short clips providing essential contextual information for critical episodes (e.g. a task introduction) and investigated links between dialogic activities away from the board and present, past, or future activities involving it. Transcripts and video data were reviewed in conjunction with interim screen shots of digital artifacts on the IWB; this helped us understand how screen shots are actively created and dynamically manipulated in conjunction with talk and written texts, extending the notion of dialogue to multimodal interaction.

The university researcher’s comments were interspersed with direct quotes about the episode or lesson from the post-lesson Interviews 2 and 3. They included questions for discussion with the teacher, intended to clarify the rationale for a particular action or interaction or views about the unique contribution of the technology. For example, one question read: “Why did you give out paper copies of the text when it was displayed on the IWB?” The document was refined after the review meeting to incorporate both reviewers’ written reflections and the outcome of their verbal negotiations, drawing on a transcript of the meeting.

This review process enabled us to identify what the data in each case revealed about the integration of IWB use to support dialogue, as well as the nature of any ‘added value’ over other tools and approaches. The newly developed pedagogical approaches were thereby scrutinized, debated and subsequently refined by the teachers. This phase culminated in a final agreed set of critical episodes from each classroom, a rationale for their selection, and some initial messages for our understanding of dialogic pedagogy in the context of IWB use.

**Phase 4: final workshop**

Five months after Phase 3, the whole team reconvened during a fifth half-day workshop (not originally planned). This session allowed us to consolidate our thoughts about dialogue and the role of the IWB across the three classrooms, and to provide feedback to the teachers on their findings and reflections on their own data before writing the accreditation reports. We discussed the expected impact within the three schools and the practical and attitudinal obstacles to adoption of a dialogic approach and IWB use by novices. We revised our drafts of the dialogue tables initiated in Phase 1 to serve as resources that might spark inquiry by other teachers (see Tables 2 & 3). We also sent teachers a short follow-up, open-ended questionnaire to solicit individual feedback on the process of collaboration and its impact on their thinking or practice.

**Phase 5: cross-case analysis**

Finally, the university research team conducted a cross-case analysis, comparing and contrasting approaches used in the three different settings. We aimed to make conditions for dialogue in an IWB context explicit so that they might resonate with other teachers’ experiences. This was achieved through revisiting videos of critical episodes plus systematic thematic coding of all (27) teacher diaries, (5) workshop transcripts, (3) review meeting transcripts, (9) interviews, (3) follow-up questionnaires and (3) accreditation reports using HyperResearch™2.6, a software tool for qualitative data analysis.

This cross-case analysis also served to solicit teachers’ perspectives on the collaborative research and analysis process itself. Our analysis resulted in six broad (non-exclusive) categories linked to the four methodological aims.

**RESULTS**

We begin in the first section by presenting data on perceived influences of the team discussions and the workshop stimuli on participating teachers’ thinking and lesson planning (Aims 1 and 3). We then show how
teacher and team thinking about dialogue evolved through collaborative construction of intermediate theory, represented in tables of ideas about dialogue and dialogic strategies (Aims 2 and 3).

Up to this point, data relates to Phase 1 workshops except where indicated. The second section includes our development of criteria for critical lesson episodes during Phase 3 (Aim 2).

In the third section, we go on to reflect on the process of co-inquiry itself and the degree of equity (Aim 4). Finally we elaborate how the resulting intermediate theory might be shared more widely and how the study has informed our understanding of the reflexive inter-relationships between theory, research and practice (Aims 3 and 4).

While the following account is written from the university researchers’ viewpoint, all teachers have read it and endorsed its validity.

**Teacher perspectives on the process of research collaboration**

*Experiences of team discussions around promoting classroom dialogue*

The clear message emerging with respect to the professional development of all participants in this study is that there are considerable benefits to be derived from fostering an environment where expertise can be shared between teachers and university researchers and, importantly, where the focus is on understanding and developing principled pedagogy (“good to take time to think of the theory behind the practice!”: Diane). By this we mean pedagogy that is theoretically rooted, explicitly articulated and laid open to critique. Initial workshops in Phase 1 yielded a range of thoughtful diary reflections from teachers, including self-scrutiny, honest expression of fears and pedagogical dilemmas, question posing, development of issues raised in our discussions and teachers’ corresponding plans, as the following excerpts indicate:

The first workshop day has enabled me to really start thinking in depth about my own practice and the powerful impact a more structured approach to ‘talk’ in the classroom could have . . . Alexander [2004 booklet] – the idea of dialogic teaching being cumulative, with children and teachers building on each other’s ideas, really stood out for me, as it is the one which I feel I currently address the least. . . . In order to move forward, I need to look now at . . . using questioning more effectively to enable cumulative talk to take place more regularly. (Caroline)

Mercer [co-author’s presentation of his prior research] – very interesting to hear about what was actually found, or not, in schools when talk was explored. Again, the curriculum pressures and the need for content delivery seem to play a part in preventing talk being used to full effect. (Caroline)

If pupils discuss things and get the point 'wrong', a teacher explanation then has some context and is more meaningful. I understand this idea better after our discussion today. (Lloyd)

Subsequent reports reflected further on various ways our team discussions influenced teaching practice and lesson planning, for instance Diane articulated dialogic objectives in her accreditation report:

I wanted the children to have opportunities to talk within the whole-class setting and in groups, and to be able to present their ideas in a range of ways. These aims were stimulated by our initial work as a research group, beginning to consider what dialogue consisted of and how it could be initiated.

Key changes to lesson planning this time were … to introduce ground rules for talking (we used a set of talking rules from Mercer’s work) to support the group work … it was especially important that the children were able to talk with focus about issues and opinions, being able to begin to articulate why particular safety rules are important.

Lloyd’s diary after Workshop 2 articulated his thinking about the collaborative inquiry and the implications for understanding the complexities of dialogue as we sought to establish common ground and iteratively developed our ideas:
We'd all obviously reflected quite a bit on the previous session. This helped make the first part of the day very interesting as we developed our definitions and ideas further. One could see us revisiting things we had talked about previously … So nothing is easy in trying to articulate what we mean by dialogic teaching. I think we have already found that it means many different things to different people and it could mean different things to the same person at different times. However… I feel there is a shared view amongst our group that learning is something much more than just being teacher-dominated a lot of the time … this is really central to what happens in the classroom. I know this is one of Alexander's key themes too … but I'm not sure he sees it as so central, so often. I'll need to think further on this.

He went on to point out that what he considered the “dialogic approach to lesson planning” in Workshop 3 was itself productive:

I like to bounce ideas off people when planning as it invariably means I can use theirs! … So, in my plan for Lesson 1, there are influences and some very specific themes/activities that come from colleagues in the group.

Caroline appreciated the logical order of “starting with the theoretical perspectives and then looking at how that applied to our current practices … each workshop session allowed us to build upon and extend our own knowledge and understanding as well as further develop the joint construction of the notion of dialogue” (follow-up questionnaire). Timetabling of her lessons on consecutive days proved problematic, however, since “the reflection and refinement of ideas for future lessons felt quite rushed”. The research timetable was generally welcomed though; it allowed Diane to “learn at a rate which was challenging but supportive”. Teachers found the discussions and opportunities to develop practice with colleagues “invaluable” and “fantastic” personal and professional development experience.

The process culminated in reports of positive experiences (including substantive outcomes for students) and individual challenges perceived by all of the teachers. Their purposeful exploitation of new opportunities posed by the technology and some changes in their practice were described, for example:

There are more explicit opportunities for dialogue built in [to my 3 lessons] … being someone who uses the IWB on a daily basis anyway … rather than just using it as a planning and organizational tool … really thinking about the purpose of each slide and how it can be used as support for the pupils. (Caroline, Interview 3)

Overall, thoroughly enjoyable, AND, the key, loads of opportunities to take things further in school. I also feel empowered to read Robin Alexander’s work critically (in a positive sense!!). (Lloyd, follow-up questionnaire)

Five months after the final workshop, Lloyd reported on some follow-up work in which a group of very low achieving students aged 11–12 used the IWB to share with the class their ideas about how images can show power:

With this group, I needed to think more about scaffolding the dialogue to help them advance their learning and 'classroom tactics'! … The IWB pen [stylus] acted as a microphone and if you had the microphone, others had to listen to you. There were also teacher prompts for things that I wanted the kids to say to try and ensure that they engaged with what the previous speaker had said.

These findings were consistent with those of Baumfield and Butterworth (2007). Professional learning situated within a mutually supportive partnership can stimulate development of teachers’ own practices. Existing pedagogical strategies and ideas about technology use can be deconstructed while keeping teaching and learning at the forefront.

Influences of workshop stimuli upon teacher thinking and lesson planning

Many of the quotations in the previous subsection offer clear evidence of the influence of stimulus resources (summarized in Table 1), explored in more detail here. First, diary reflections and reports included teachers’ considered responses to the literature and university researchers’ presentations, and the issues of personal significance they were consequently stimulated to address:
Mortimer and Scott [2003] – although the “Communicative Approach” grid seemed quite hard to apply to the examples given initially, upon reflection it does seem useful as a way of categorizing the … different kinds of dialogic teaching at different stages of the lesson … Looking at where to place the authoritative talk so that it helps to construct some degree of ‘common meaning’ from speculative discussion is what would logically seem to lead to the deeper levels of understanding we are hoping pupils reach. (Caroline, Workshop 1 diary)

I found the specific input on the work of Alexander and Mercer very interesting, as it resonated with the work we have been doing in school on Assessment For Learning, developing teachers’ questioning skills and developing Speaking and Listening. I was challenged to think about the way in which we help children to participate in dialogue, about what vocabulary and language we use, and how we use questioning to gauge the level of children’s understanding within lessons. (Diane, accreditation report)

Caroline considered Alexander’s (2004) dialogue booklet “very clear and accessible” and felt able to put his ideas into practice. Lloyd likewise considered it a “very, very useful stimulus” and welcomed its “contentious issues”. He had even mentioned it in his discussions with the two Learning Partners who had requested more debate (with students being challenged to justify their positions) in lessons. This had raised further questions for Lloyd, aired during his video review meeting:

Alexander talks about teachers in England and Europe being different in the way that they challenge kids’ contributions. … and [students] were quite interested in that … Perhaps I need to ask questions that are going to allow me to challenge kids’ responses more. Fair point.

Is there something in that “dialogic teaching” that the kids see their importance in making it work well as well? … You know, “this is a learning community”. “We all have responsibilities.”

Lloyd was particularly taken with the Mercer et al. “Thinking Together” materials and planned to share them widely:

REALLY REALLY USEFUL!! These materials are [readable and] great to encourage discussion about different ways of approaching things in the classroom … Am hoping it’s okay to publicize in school as we want all teachers to be able to benefit. I really feel, with some guidance, colleagues will use it, at least for discussion. I also intend to make senior managers aware of it. Useful for Heads of Faculty discussions.

He was also pleased to receive a copy of the book by Mercer and Littleton (2007) as a present from us after the study and reported that he planned to share sections from it with student teachers.

Caroline appreciated the Cardellichio and Field (1997) paper on questioning because it “reinforced previous work in this area and again provided practical ideas.” All three teachers found a presentation about dialogic teaching and learning (including ideas and transcripts concerned with managing talk) helpful in stimulating thinking about the meanings of terms. Caroline said in her follow-up questionnaire that the presentation helped her to “recognize what [she saw] happening in [her] own and colleagues’ classrooms – highlighted time pressures with respect to meaningful talk”.

Both Caroline and Diane reported that they found Lloyd’s lesson observation coding system appealing and wanted to try it out in their schools. This scheme included – and thus exposed these two teachers/schools to – some of our “intermediate theory” terminology derived from the T-MEDIA collaboration, for example new categories of dialogic interaction such as dialogic class discussion, dialogic peer discussion and dialogic synthesis.

Teachers also described what they had learned from watching the T-MEDIA video clips, as illustrated below. Lloyd highlighted the utility of considering alternative approaches to the practice depicted, a key element of our professional development approach here and more generally, and articulated how he had realized the importance for dialogic teaching of exploiting the permanence afforded by the IWB:

I’d seen the T-MEDIA Science video before but our discussion helped me to reflect from other angles on it (dialogic learning!) [and] made me think about applications of [the IWB] in my own teaching. It was also useful to share ideas on other things that Chris might have done in the lesson. This, again, can lead to new ideas for us all. The clip and discussion also re-emphasized the ability the IWB provides to
store pupil work. It doesn't have to be wiped away! Over time, with this technology used more and more, this could have a bearing on how kids view the importance of their ideas to shared dialogic learning. (Lloyd)

After seeing the Science clip where children worked on a true/false/don't know task and were then given input, I tried this with an informal Science assessment. Children worked in groups, sorting statements about shadows/reflections. I listened in/discussed also, then we drew together ideas, shared explanations, came to conclusions … with children very involved throughout. (Diane)

[Watching the initial video recordings] confirmed that teachers must create a secure setting in their class, forming strong working relationships with children. (Diane)

Teachers also gained insights from discussion of their own pilot video clips and from each other’s clips:

[Being filmed] made me notice the way I often reformulate children’s responses and consider doing that less often to help children to listen to and question each other. (Diane)

In what you [Lloyd] said, you set up that all answers are very acceptable, by giving status (“what you bring to this lesson can change our knowledge”), what language you use with the children. (Diane)

I thought you [Caroline] were scaffolding really well. When they needed a bit of help you prompted them … you were suggesting there in your body language, “you found out something that I haven’t thought of”. (Lloyd)

However, Lloyd found all of the clips less useful when watching with the group; he felt they were “hard to contextualize” without more information, although workshop time constraints of course acted here.

Finally, teachers reported having “greatly developed” and varied their (initially competent but not expert) use of the IWB as a resource to support talk. They appeared to become confident with astonishing rapidity, sharing with colleagues many of the technical skills they had learned from Chris, and expressed gratitude for his “particularly inspirational session” and “invaluable practical guidance”, “[He] fired me up with some great ideas … Some trepidation at how easy he made it look!” (Lloyd).

This morning I showed the other Year 6 teacher the Square of Truth which I made after getting back to school on Friday after the workshop – she loved the idea, and an hour later had made a Chicken of Truth to check right/wrong spellings! I obviously stole this and tried it with my children at the end of the morning after our spelling lesson – children loved it! (Diane)

Chris had offered pedagogical messages too, integrated with exposure to new kinds of IWB use, and these were recorded in post-workshop diaries for future consultation, and in some cases reportedly drawn upon in the lessons observed.

Two teachers had been inspired by our demonstration of the visualizer technology (a digital form of overhead projector connectable to the IWB for instantly displaying, manipulating and saving images of concrete objects), new to all of them. Lloyd immediately bought one and found it motivating to students, supportive of dialogue and very useful for showing resources and student work. He also reported that our mention of using mini-whiteboards to engage the rest of the class while one student was at the IWB had stimulated his thinking and consciously led to his extensive use of mini-whiteboards during and after the lessons filmed.

**Development of teacher and team thinking about dialogue and of subsequent classroom practice**

**Co-construction of intermediate theory via the dialogue and dialogic strategies tables**

An important feature of this work has been the collaborative development of a common theoretical framework, tailored to our needs and interests (Butler, Laushcer, Jarvis-Selinger, & Beckingham, 2004; Groundwater-Smith & Dadds, 2004). The critical co-inquiry process resulted in shared perspectives on (1) the nature of dialogue in this new context and (2) teacher strategies for dialogic teaching and learning with the IWB. These were under continual development by the group throughout the workshop series; the last iteration of our first dialogue table is exemplified in Table 2. Space precludes reproducing the full table, likewise we do
not include the extensive table of teacher strategies for technology use; this is of more peripheral interest and is explored instead by Mercer et al. (submitted). (Many strategies were linked to the dialogue table itself, describing how the teacher might set up the climactic conditions or support development of the dialogue elements listed. A couple of key examples included: “Revisiting flipchart resources/annotations to reignite understanding and sustain dialogue over time”; “Collating and comparing multiple representations, requesting interpretations of other students’ ideas, encouraging orientation to others’ viewpoints”).

The properties of dialogue we identified were arrived at through team discussions that (a) considered how classroom dialogue might differ in quality and intention from general classroom talk and (b) synthesized different viewpoints from the literature along with ideas arising from our classroom observations and experiences. The group’s conception of the notion of dialogue widened to include the use of multimodal forms of dialogue at the IWB and non-verbal dialogue away from the IWB. The original table headings (superseded by those in Table 2) portrayed three interrelated functions of classroom dialogue as “markers” that could be associated with specific properties: it supports “co-construction of knowledge-and-understanding” and “cumulative knowledge building”, and “it makes reasoning explicit”.

<Table 2 here>

An illustration of how a university researcher and a teacher negotiated formulation of one idea in a review meeting is as follows. We discussed the requirement Lloyd had made for students to work in pairs to produce a joint storyboard for a video, unusually integrating their ideas (without prior notice) after creating individual storyboards on mini-whiteboards:

Lloyd: The “[are you] finding it hard to agree bit”, I talked about that with Joe and Felix [Learning Partners], and Joe quite rightly made the point that often the things that we are asked to discuss, we do agree on. So what do you then do?

Sara: I think a storyboarding exercise, they had to do that completely independently and then reconcile their ideas so … what they're doing is accommodating their views to each other. […]

Lloyd: It should go somewhere near there [indicating on dialogue table] to draw the distinction … that some activities might be more about accommodating the views of others; some activities it's more about changing one's mind. […]

Sara: Oh here it is, we have, look [indicating on table]: “Orienting oneself to others’ perspectives. Appropriating words and ideas for own purposes.” It's another step though, it's slightly beyond that.

Lloyd: It’s more than that, isn't it? Orienting oneself to others’ perspectives means an understanding.

Sara: Yes, it’s developing a joint outcome that actually accommodates the views of others, as you said.

Lloyd: Willingness to change one’s mind, or yes, willingness to work on the ideas of somebody else as well as your own. “accommodate others’ views” was subsequently added into the existing phrase “willingness to change one’s mind (pupils & teacher)” in the dialogue table]

A related, important example was the team’s debate and reconciliation of different perspectives in the literature on the notion of “cumulative”. We found confusing the term “cumulative talk” as used by Mercer (2000) to mean passive, uncritical accumulation of utterances in which contextual references are left implicit and individual differences in perspective are minimized. This definition differs from Alexander’s (2004) description of dialogue as “cumulative”. Alexander’s account of chained lines of thinking and inquiry (with teachers offering learners individually tailored responses) is more akin to Mercer’s “exploratory talk” in which partners build critically and constructively on other’s utterances, actively offering suggestions and justified arguments for joint consideration (“co-reasoning”). To construct our own representation of dialogue in Table 2, we adopted Alexander’s notion of cumulative (which “stood out” for Caroline in her first quote above); shared understanding of this term underpinned the above excerpt in which some of its nuances were negotiated. We incorporated the principles of exploratory talk in other parts of the table, refining and merging them with ideas from Bakhtin, 1981 and others, as with “Orienting oneself to others’ perspectives” (above). These examples illustrate the process of jointly “trying to articulate what we mean by dialogic teaching” as Lloyd described in an earlier quote.
Our whole-team workshops were the main forum for refining our understanding of dialogue, and one contentious issue in the literature that provoked extensive discussion on a couple of occasions was the question of whether participants in dialogue need to reach a consensus view, as is suggested, for example, by Mercer and Littleton (2007, pp.72-73). The phrases “common understanding” and “common knowledge” are sometimes interpreted in terms of convergence, while Wegerif (2007, p.282) states that dialogue is characterized by “uncertainty, multiplicity and open-endedness”. There is concurrence that disagreement offers an important stimulus for communication and change, creating contexts where propositions and explanations are more likely (Howe et al., 2007), but Mercer and Littleton and Howe et al. also assert that working towards a carefully reasoned consensus viewpoint – weighing up the relative strengths of opinions to achieve a group view rather than acquiescence to another or majority view – keeps participants engaged with others’ ideas.

The following edited excerpt from Workshop 5 gives a flavor of our typically cumulative discussion around this issue, illustrating some of its ebb and flow; all participants initiated or sustained discussion at times, and grappling with ideas was often challenging and nonlinear, even cyclical or a struggle occasionally, although ultimately fruitful. Extended workshop time proved important in allowing us to come to (interim) decisions in most cases.

Diane initially linked the issue of consensus to a filmed episode, where a boy who typically did not work well in groups managed to work with a partner when asked to “come up with advice we would give people” in a potentially dangerous scenario:

Diane: They didn’t reach a common consensus at all, but they still worked really well together … and Jimmy, who obviously didn't agree with Alex, had written “still wouldn't trust the woman” at the end! … he was aware of his need to have his opinion acknowledged, but he did it in a way which for him was very sensitive and really supportive. But they didn’t reach a shared understanding, although they did reach a shared understanding of what they were being asked to do, which was to maybe explore the issues behind that scenario.

Lloyd: Do we have [in the table] this notion that discussion can lead to an understanding that there are any number of views? Do you see what I mean? Is that slightly different? Because that’s quite powerful, what you’ve said. […] We see things from a number of different perspectives and that might not lead to even a synthesis of those views, might it? […]

Paul: A consensus allows you to move forward, I think that's why it's powerful, isn't it? …The struggle to get to some kind of consensus gives you the basis for the discussion, doesn’t it?

Sara: Yes, but that's in the process thing. You don’t actually need to reach that consensus.

Lloyd: No, it could be both, can’t it. It could be that, and it could be a number of different valid views, or appreciation that there are a number of different valid views and produce a synthesis or something. […]

Paul: I think some tasks absolutely require some kind of cumulative, grounded understanding and a single perspective from which to move on, and others require an articulation of the fact that there isn't such a thing.

Sara: So, I think we need to change this in column 2, don’t we? “Aiming at a common understanding” sounds too wide ranging. […]

Diane: “Potential”?

Sara: Yes, it’s “potential”, isn’t it? Well I'll put that in for now. […] Is that common understanding that you’re sometimes working to, something that … has taken forward the thinking that each of you as individuals had and together you've gone further than you would have done [alone]? Because Christine Howe's studies [in science] showed, didn't they, that if you make groups come to a consensus, sometimes that view is inferior to what some of them started with … So, is actually the quality of the outcome as important as the quality of the dialogue in the sense that the understanding is not any old “common understanding”, but one that moves you forward?

Diane: So it’s better to know of a range of things and to have considered them, than to have had to accept something which as you say is inferior or could be a step backwards, which could be incorrect...
Lloyd: Which is a slight issue with the notion of common understanding, isn’t it?

Sara: Yes, it is. It’s a problematic notion.

The discussion continued at length and ultimately we agreed that consensual agreement is not a prerequisite for learning through dialogue although the process of striving for it through challenging and exploring difference may be fruitful. (This was corroborated by one Learning Partner who told us in the review meeting “If you are [working] in a pair you’ve got the problem that if they don’t have a different view, you don’t really have anything to do.”) Caroline expressed our view most eloquently, relating it to the teacher’s role in developing learners’ skills and structuring opportunities for dialogue:

For me it always comes back to the reasoning and justification and having a solid argument. So you don’t need to agree, but you need to be able to justify why you hold the opinion you do. It’s having the structures as well to recognize other views and compare them to your own, and having the language to do it as well.

“Appreciation that there are a number of different valid views – sometimes a synthesis” was incorporated in the dialogue table.

**Diane’s representation of dialogue**

A significant milestone in development of intermediate theory occurred when Diane spontaneously created her own organization of our documented characteristics of dialogue, regrouping them under “Climate/Conditions”, “Skills/Approaches” and “Outcomes”. Her intention was to express the process of developing dialogic teaching and learning in her classroom in a way that could be directly applied to support professional development of her school colleagues, as elaborated in the next section of this paper. Ultimately we worked with an updated version of her representation (see Table 2) as we found it so useful, despite Diane’s tentativeness about putting it forward (at Workshop 3), because of difficulties she experienced:

I found it quite difficult to separate my very practice-orientated approach from the academic concepts, and to identify nuances in the similarity or differences between related concepts … Whilst I found it intellectually challenging, I also felt well supported by the group when exploring my own ideas, especially in relation to my version of the dialogue table.

Her table underwent a second major iteration when she devised “more accessible” terminology (illustrated in Table 3, the last negotiated version) in order to “explain to staff (and students) at school how dialogic teaching works”. Another excerpt from her accreditation report:

[My first] table was briefly shared with staff at our IWB/dialogic teaching staff meeting. Following the critical episodes analysis, I developed this table further to make it more “teacher-friendly”, changing the headings to “In my classroom, we:”, “You will see us:” and “So that we can:”. Additionally, I added in some guidance [in bold italics in Table 3] to illustrate some of the ways teachers could address adopting a dialogic approach.

Diane’s process for developing her representation through articulating her craft knowledge is detailed further in a case study report by Warwick et al. (in preparation) that also charts changes in her thinking and practice over time. Here we focus primarily on how the table acted as a communication device for the team, representing our thinking as it evolved. The following excerpt from Workshop 5 illustrates how an element of Diane’s draft phrasing was challenged and further negotiated (i.e. intermediate theory in the making).

Paul: “Being critical in a constructive way” is a bit tricky.

Diane: Yes, that is quite hard, isn’t it? So then I was wondering about whether we use the word “feedback”.

Paul: Do [students] understand “feedback” and “I want you to give some feedback to people”?

Diane: Well it’s going to depend on [their] age, isn’t it? But older children certainly are … used to giving constructive feedback …

Lloyd: “Giving feedback in a constructive way”? 
Creating a collaborative and reflective atmosphere in teacher learning through dialogic practices

Sara Hennessy, Paul Warwick and Neil Mercer

Sara: “Giving feedback that helps people”?

Diane: Yes. […] So what I was thinking that would refer to was when they want to disagree but they do it in a way which is kind of considered. It’s in keeping with the ground rules, isn’t it? Of respect for each other …

Paul: “Saying what we think in a way that helps” might be a helpful.

Diane: Mmmmm

Sara: Well, it’s giving feedback, isn’t it? “Giving feedback in a way that helps”, how about that?

Caroline: It’s “responding”, isn’t it, in this sense?

Paul: So we’ve got “giving feedback/responding in a way that helps” or “in a constructive way that is helpful.”

This exchange and those preceding illustrate how amicable our negotiations were as we articulated and debated the nuances of the emerging framework. A non-judgmental atmosphere characterized all of our exchanges and disagreements; this was essential for fostering confidence in all of us (as genuine co-inquirers) to acknowledge a lack of knowledge or understanding (Feito, 2007). Agreed phrasing often incorporated a subset of suggestions made by several participants, as above (itself embodying the notion of consensus). However, our team discussions and the tables as external representations of our thinking also encompassed a view of knowledge that is fluid and constantly renegotiated.

Drawing on Bakhtin (1986) and others3, we perceive the development of our own thinking in the same way as we view classroom dialogue – as a dynamic, situated and ongoing process whose individual and collective dimensions are interdependent. In this view, new meanings are never final or fixed but emerge between intentions and responses of participants as they put forward what they see as significant to the group and they arise out of (rather than overcoming) difference (Wegerif, 2007). Thus, our tables were only “finalized” in the sense that the funded project inevitably ended, but individual participants will no doubt continue to encounter or develop further examples of classroom dialogue. Our thinking and struggles to make sense of the key ideas and issues (hence internal dialogue at least) will be ongoing over time. Jaworski (2006, p.204) likewise emphasizes that

in a community of inquiry, rather than providing solutions … critical inquiry or critical alignment creates the clarity and strength of purpose to recognize and … tackle [problematic] issues consciously and collaboratively. It does not remove the issues, nor … tension or discomfort.

The discussion in this subsection and the preceding one illuminate how we as university researchers engaged in and benefited equally from wrestling with dialogic theories and their relationships to practice. Our own understandings of dialogue per se and in the context of activity supported by whole-class technology became much clearer as we worked with our practitioner colleagues to synthesize elements of the various theoretical perspectives, drawing closely on what we learned from their practices and practical theories.

Embedding dialogic principles in teacher practices and thinking

The teachers described various applications of the dialogue tables, as illustrated further in the following examples. All of these mentioned grounding of the elements in their own practice (“When we talked about what they were, we explained situations in which you might see those things”: Lloyd). For instance, in Workshop 4 Diane reported how she had tried using the table as a checklist when reviewing her own lesson videos: “After a while I thought ‘I’m marking loads of these, that’s really good!’” She suggested that this technique might have utility for other teachers in “building in time to review and reflect: how do we know whether dialogue is happening?” Diane deliberately did not add guidance to the “You will see us” column since she “anticipate[d] that this would form a good collaborative task for staff members to undertake as part of professional development work”.

She also mentioned how development of her revised representation (Table 3) reflected changing patterns of interaction in her classroom”

“Telling each other what we’ve learned when we were thinking by ourselves”, you know, that’s about the “internal dialogue” thing, isn’t it? That struck me because last week we were doing “anti-bullying
week” and somebody said to me … “All week I’ve been thinking, can grownups get bullied, where they work?” I liked the fact that she was saying: “All week I’ve been thinking …” I might not have picked that up in the same way before.

Lloyd’s follow-up questionnaire confirmed his belief in the usefulness of the processes of reflection and trying out ideas:

Taking a few points and trialing those was useful … I’ve developed my teaching of the Suffragettes as a result … and aim to use the notion of “willingness to change one’s mind” as something to frame lesson activities.

“Willingness to change one’s mind” emerged as a significant construct in our thinking about preconditions for dialogue and its ‘tentative’ nature, and one that was supported in the classroom by the provisional nature of objects on the IWB. Lloyd in particular embraced it. Earlier we described how he deliberately challenged students to take others’ views into account in creating a joint video storyboard. He then discussed this explicitly with the class: “I suspect most of you … at some point might have had to change your mind on what you’ve thought here. Is that right, or not? [Students: Yes.] Has that been easy or difficult?”

Diane provided some helpful introspective reflections on the journey she undertook and identified some mechanisms through which she believed it had led to change:

At the time the project started, I guess I was very unsure of what dialogic teaching really was … Participating in the project gave me access to dedicated input from specialists, as well as the added extra – filming – which allowed me to review and consider what happened in the lessons realistically, and to look beyond my initial impressions of what the children had learnt. (Follow-up questionnaire)

I do feel that there has been a real change, certainly in my thinking and in the way that I feel very committed to exploring this kind of learning … I explicitly don't repeat back what they say, as much, and I actively ask them to … respond to what each other have said. (Interview 4)

For her the process culminated in detailed and thoughtful recommendations for other teachers that further elaborated how she had extended her own understanding of dialogue and incorporated IWB use. For instance her accreditation report proposed:

Planning should include opportunities for talk which are not just focused on getting the “right answer”, but may involve speculating, questioning, criticizing and building new understandings of concepts. This must be backed up by skilled teacher intervention in modelling and prompting children to question each other’s ideas and views, eg “X, what do you think about Y’s idea?” … [and] planning for opportunities within lessons for children to see the IWB as not just the teacher’s resource, but their own; a resource which can aid them in recording or presenting their views.

In sum, our case studies of teachers’ experiences of adapting a pedagogical approach to accommodate technology use within their own settings illustrated how they went beyond an improved understanding of classroom practice to moving forward in both their thinking and practice in some concrete ways. Although causal linkages cannot be established firmly in qualitative case study data, our confidence in this statement derives from the wealth of evidence where links were made explicitly, as illustrated above and also in responses to the questionnaire item “How did participation in this project impact on your thinking or practice at the time or since?” All three responses indicated that the process had directly increased awareness and understanding of dialogic teaching and “the principles behind purposeful talk in the classroom” (Caroline). For instance Lloyd wrote:

Developed my thinking about dialogic teaching enormously … I had my ideas broadened by teachers, researchers and pupils [the two Learning Partners]. Has made me reflect on [what is] “knowledge” …

Each of the teachers reported subsequently continuing to develop their new form of dialogic practice and to share this, our workshop resources and research findings, especially the ultimate version of the teacher-friendly dialogue table, with colleagues across their schools in ways that were practically relevant to their professional development. In Caroline’s case, the whole-school development focus on dialogic teaching was instigated as part of a Masters in Education project that she is currently undertaking at Cambridge to follow up
the work. The two other teachers also wanted to extend this to teachers elsewhere ("actionable practice": Groundwater-Smith & Dadds, 2004).

**Development of criteria for critical lesson episodes**

Discussion during Workshop 4 led to our ultimate definition of critical episodes as follows:

(a) collectively illustrating a range of IWB uses;

(b) including dialogue that is: stimulated by well-selected resources that are engaging and/or meaningful to learners; linked with any level of IWB use but including some pupil ownership of the board; arising from opportunities for focused, cumulative, open-ended discussion in whole class, pairs, or groups; moving forward students’ learning.

To illustrate how this definition was developed, again grounded in current practice, and how we both took up and directly challenged each other’s ideas we can look to the following excerpt from Workshop 4. (Phrases in italics directly informed our definition.) This culminated in a unique research tool that can be of practical use in future when analyzing practice in IWB-supported settings:

Lloyd: I think it’s quite focused pair discussion which was important in all this … Is there something as well … about moving on in terms of either teacher intervention that helps the dialogue, perhaps this isn't cognitive necessarily but a way of moving on the learning through dialogue. The reason is I thought there was one at least where I connected what two kids had said with another two kids. […] Sara: Cumulative is an important characteristic then. What about the use of the IWB, what do we want to say about that as a criterion? …

Caroline: It would be quite nice to see a range of uses across all three lessons.

Diane: So whatever is on the IWB it needs to be engaging or meaningful to the children. [For example] they could be recording their views by themselves or with the teacher. And it could be playing a few that they've had, if it's engaging.

Sara: OK, anything else about the IWB use?

Paul: I think not necessarily whizzy.

Diane: That’s what I mean about being engaging. It can be a fantastic visual, an intriguing sound clip, one of those Flash files, one of those PowerPoints with animation or a statement that makes them look on the board [others agree]. It has to be well-chosen, things being well-selected. …so that actually the children will want to use it. […]

Lloyd: I think with the word meaningful it means whizzy. Why do we need the word engaging, if it’s just meaningful?

Diane: When you were saying sometimes children are turned off from listening to the teacher, and in terms of the fact that sometimes the whiteboard can offer a way of engaging their attention … and sparking their interests … And it can be very simple indeed, or it can be whizzy. Whereas meaningful, if something is engaging, it is not necessarily meaningful to the children because they have no ownership, no involvement.

**The dynamics and methods of co-inquiry**

We feel it important to reflect upon our experiences in the research collaboration and the evolution of our respective roles. As in other co-inquiry partnerships (e.g. Goodchild, 2007), the research focus, design and methods were mutually considered as the responsibility of the university team who had specified these when securing funding for the work; this included sourcing all of the workshop stimulus materials. The process of co-inquiry began during the pilot filming and continued throughout the workshops, data collection, data analysis and development of the dialogue framework (Phases 1–3). All of us interacted (individually and collectively) with – and formulated responses to – the literature, video and other resources. We drew heavily on these in synthesizing ideas about dialogue in the context of IWB use. In between meetings, the teachers
wrote their reflective diaries and the university researchers prepared workshop materials, processed the data, and updated (and circulated) the dialogue tables with each round of democratically agreed changes.

Both lesson planning and design of the teachers’ personal projects were conceptualized and managed entirely by individuals and driven by their particular interests in exploring dialogue within their own settings. They thus enjoyed a significant amount of influence within the larger shared inquiry, and undertook independent research in their own right under its umbrella, stimulated and continually informed by discussions within that arena and shaped by their developing metacognitive awareness (illustrated earlier). Two projects (by Caroline and Lloyd) surveyed student perspectives on the more dialogic approach to teaching and learning that was developed, and solicited some positive feedback and thoughtful student reflections.

Recurring themes were the importance of considering and comparing a wide range of diverse viewpoints, taking all of them seriously and learning from others through talk. Diane’s project charted development of our dialogue table and how her own thinking and phrasing had strongly influenced its formulation, producing a generic professional development tool. Accreditation (offered after recruitment of participants) was voluntary, so unanimous engagement confirmed our belief in these teachers’ desire to participate in continuing professional development and self-reflection (something that prompted their original selection). Their own research and writing provided an additional motivation for engaging with the literature and other stimuli, and for making personal sense of the ideas encountered. While the accreditation process ultimately required feedback and evaluation from university researchers, potentially creating a power imbalance, commentary was not given until reports were submitted some months after the end of the workshop series and the process was not perceived by any of us to impede equitable working. Commenting on our practitioner colleagues’ writing for an academic purpose was simply another way in which our scholarly expertise was shared with them, and in turn their reports held an important status as data in their own right (for all of us), as their use above and in joint outputs (see Conclusions) confirms.

The dynamics of interaction between the practitioner and university researcher communities were perceived by all participants as harmonious and respectful. Although the university researcher leading the project organized and facilitated the workshops and meetings (so there was a power differential in that sense), there were genuinely equal opportunities for contributions by all participants. This contributed to rapid formation of a single, productive community of inquiry (Jaworski, 2006), a team of co-learners with common aims and language, and shared ownership of ultimate outcomes. Indeed, while we looked for evidence of constructive criticism or negative reactions to any of our techniques, there were very few instances noted. Two interrelated factors believed to have facilitated the smooth evolution of our complementary roles during T-MEDIA applied again in this study and contributed to the teachers’ noticeable ease in working with us:

- our lack of specialist expertise in their particular subjects and thus disinclination to offer input into or evaluation of classroom activities; our focus there was only on the dialogue and associated technology use;
- our previous relationships derived from working together in other contexts and ways, which generated an atmosphere of mutual trust and respect for each other’s unique forms of expertise and prior experiences.

We believe that (a) made for a more equitable relationship than research partnerships in which university-based participants have themselves taught the subject at school level and plan lessons or exchange roles with the teacher – and in which significant tensions may arise (Wiske, 1995). We had no expertise in the particular subjects, and our roles were distinctly not those of teachers or teaching mentors. This time, however, the discussions involved additional input from the other practitioners who spanned different school subjects and phases, allowing us to work together towards a non-specialist perspective on both classroom dialogue and research-practitioner collaboration – while acknowledging that certain aspects of our theoretical framework of dialogue and certain dialectic strategies probably remained more salient for individuals because of their subject orientations (or personal approaches; the small sample made it impossible to explore differences systematically but it would be interesting to do so in a larger study). We observed that the teachers transcended the subject divisions with ease, often exemplifying their ideas using their own subject practice (Diane as a primary teacher taught multiple subjects anyway) yet working as part of our team in constructing a generic representation of dialogue (as the transcribed data above confirms). The work of Fisler and Firestone (2006) on teacher learning within a school–university partnership shows that collaboration, observation and
feedback all involve risk for teachers, yet (b) led all participants here to display sufficient confidence and trust in working with other colleagues we had selected (though strangers to each other) to engage in collaboration.

Our earlier work recognized that success in collaboration largely depends on equally valuing, deliberately exploiting and purposefully integrating differing forms of prior professional expertise that each individual brings to the workshop table. In the present study, the teachers were the recognized experts in terms of situated pedagogical knowledge for both supporting dialogue and designing activity to optimize IWB use. As before, they were also viewed as keepers of rich contextual knowledge about the students, the school and the subject curriculum. Likewise the researchers had more scholarly knowledge available to draw on; however, this time one teacher had already encountered and debated Alexander’s and Mortimer and Scott’s ideas about dialogue during T-MEDIA and enthusiastically incorporated our final representation of them into a whole school lesson observation schedule. As the only teacher who had previously participated in our earlier research, Lloyd had an advantage in terms of familiarity not only with some of the theoretical constructs but also with the process of joint theory building, thus increasing his confidence.

Three additional, motivational factors are proposed to have emerged in this study, beginning with the teachers’ particular receptiveness to scholarly theory and willingness to make explicit (and alter) their beliefs in this study, attributed to resonance of the spotlight on dialogue with their preferred pedagogical approach and a shared desire to increase understanding, prevalence and effectiveness of dialogic pedagogy.

Our experience of maintaining equilibrium between teacher and university-researcher perspectives during the T-MEDIA video review process made it easier to maintain one this time around, while (b) and (c) served to reduce the need for constant encouragement and reinforcement of the need for teacher input in the project collaboration. A collaborative mode of working and confidence to share perspectives were evident from the start this time, as this excerpt from Lloyd’s diary written after Workshop 1 indicates:

I felt a real sense of the group collaborating very well. I learned plenty from everybody … Challenging each other too in a very supportive way. Plenty of opportunity to re-shape one’s own thinking. Sense of teachers and researchers with a common purpose. … Particularly important is that while the IWB is a key tool, it has to serve learning purposes.

The final sentence describes a view that clearly emerged as being shared by the whole team.

Our co-inquiry offered a vehicle for exploring and developing dialogic teaching in a novel practical context and simultaneously for further exploiting a technological tool teachers valued and already used on a daily basis. This finding is consistent with the identification by Baumfield and Butterworth (2007, p.421) of a critical pre-condition for co-learning as framing the project “in such a way as to pose questions that were of mutual interest to all participants and where there was sufficient uncertainty or ambiguity to instigate the need to exchange ideas and interpretations”. The teachers’ affinity with a dialogic approach (c) and autonomy in developing this further through planning their own lessons within the national curriculum framework and existing scheme of work for the coming weeks meant that we avoided the marked tension experienced by Goodchild’s (2007) teachers between the imposed inquiry teaching approaches (with “tasks” devised by the project director) and curriculum demands. That tension resulted in requests for a stronger focus on lesson planning with peers (that were not satisfactorily met), and a lack of evidence of “innovation and internalization” (ibid., p.201). By contrast, development of strategies already embedded in practice means that the practice is already attuned to the complex realities of the classroom and therefore has higher external credibility (McIntyre 2005 p.378); this undoubtedly contributed towards success here.

Related to this we identified a strong mutual interest in research inquiry and in exchange across our community boundaries; a vested interest by teachers in the goals, namely evolving and adaptable explicit representations of dialogue that were both classroom-specific and generalizable to other classes, teachers and even subjects.

These interests are illustrated in the analysis and quotations in earlier sections. Success factors (d) and (e) also proved critical for Baumfield and Butterworth’s (2007) teachers, who valued access to research experience, making links with other practitioners and the prestige of working with a university.
The teachers increasingly made (both tentative and more confident) suggestions that shaped the characterization of dialogue and dialogic pedagogy, as illustrated above. In one case we saw how the teacher undertook to devise her own framework for representing dialogue for her school colleagues; this experimental characterization was ultimately adopted by the whole team.

All of the above self-evidently set the scene for dialogic interaction between ourselves as co-inquirers sharing some common goals. The process of developing a collective perspective on classroom dialogue supported by technology was itself cumulative over time as we responded to and progressively incorporated each other’s viewpoints and selected perspectives from the literature. To achieve the best fit with practice the viewpoints were treated as pliable, tested and validated or reconceptualized through critically scrutinizing a series of videoed examples from the participants’ own lessons and other sources. We posed new questions and challenges to each other (as portrayed above) and made our own reasoning explicit as we continually renegotiated and refined our ideas and their expression. In sum we created a supportive and ultimately fruitful environment for dialogue about dialogue.

CONCLUSIONS

Evolution of intermediate theory through co-inquiry

The work reported in this paper refined an evolving methodology for deconstructing and developing dialogic teaching practice using the IWB. Our collaboration included an equitable researcher–practitioner exchange in a process of video review and intermediate theory building. This process involved critiquing a range of carefully selected external stimulus resources: both theoretical and practical outcomes of a range of published literature and the team’s own prior research, video footage from teachers’ own classrooms and other video exemplars of teaching practice. Workshop interchanges formed a basis for ongoing practical theorizing about the processes underlying dialogic teaching and learning. University researcher and practitioner perspectives were integrated during these workshops along with insights from prior practice, the thinking evolving through team discussions, diary reflections and interviews, and iterative reviews of new lesson videos and other data. We wrestled with the theories of dialogic pedagogy in terms of how they interacted with practices in the three specific settings, both informing and illuminating them. Scholarly theory, teachers’ professional knowledge, practical theories and practice were all thereby informed by the research in progress, and vice versa, so that the boundaries between them became increasingly blurred. Intermediate theory building was thus a complex, reflexive process of construction that continually blended elements of these different types of knowledge in a myriad of combinations. Lloyd and Caroline had inquiry projects that additionally yielded knowledge about student perspectives on dialogic teaching and these shaped their subsequent practices and fed into the presentations of their work.

The co-inquiry process itself was captured through analyzing reflective teacher diaries, transcripts of meetings and workshops, follow-up questionnaires and accreditation reports. The resulting data illustrated how the process of engaging respectfully with, and questioning and reflecting on each other’s practices, was itself dialogic as we sought to co-construct, test and refine new meanings and interpretations of dialogue and dialogic pedagogy in a novel context. The process culminated in democratically negotiated, enriched understandings and recontextualized formulations of these constructs, framed in accessible language and grounded in authentic classroom practice.

We conclude from our study that collective in-depth reflection on the applicability of grand theory about dialogic interaction to practice both “filled out” (Ruthven, 2001) the notion of dialogue and extended it in new directions. The theory was made salient through sharing the substantive outcomes of this research carried out by a small number of teachers, but it intentionally remains open to questioning and reformulation by others. This includes theorists, for whom there are implications for (a) providing potentially valuable feedback from testing applicability of their theories in relation to planning and analyzing classroom lessons and consequently (b) suggesting reconciliations and refinements: for example, developing some insights here into the often contradictory notions of cumulative discourse and consensus building, and extending its common association with “talk” by conceptualizing new, more visible and reuseable digital artifacts that both stimulate and embody dialogue. Intermediate theory is by its nature both situated and principled so that while its representation captures the outcomes of working in a small, finite number of settings and some minor
variation in these outcomes may thus arise across teams exploring similar issues, there are also significant invariants across settings. Its wider use in classroom practice is explored in the final section. Note that the theoretical insights and, in particular, the reframing of dialogic teaching and learning in terms of the use and revisiting of multimodal artefacts in mediating learning over time, are the subject of ongoing theorizing (Hennessy, in preparation). They complement the learning evident in evolution of the methodology and constitute a key substantive outcome of the study for us as academics and potentially of interest to colleagues elsewhere who share our research interests.

Ultimately our collective representation of dialogue became a valuable tool used purposively by the teacher participants for both deeper analysis and improvement of practice in other teaching contexts within their own and colleagues’ classrooms. While teachers can sometimes become too dependent on researchers for sustaining instructional changes (Butler et al., 2004), developing a community of inquiry of the kind described here, including accreditation projects, meant that ultimately teachers and schools pursued their own goals (as reported too by Jaworski, 2007) and constructed their own meanings of dialogue. Indeed we were surprised and pleased to find that in each case study, self-sustaining, whole-school practical initiatives pertaining to fostering classroom dialogue across subject areas spontaneously evolved and were shared with novice teachers. These are ongoing although the project has officially terminated. This was a remarkable substantive outcome in itself, confirming that the risk we took in bringing together practitioners across disciplines paid off. Conducting a genuine inquiry in collaboration with teachers while maintaining academic rigor may ‘remain the exception rather than the rule’ (McIntyre, 2005, p. 372) but based on our research, we contend that it is achievable and rewarding for all participants and can yield useful wider applications.

The collective and individual outcomes of the collaboration culminated in a joint international conference session (6 months later) requiring the whole team to reflect further on what we learned. Drawing on their accreditation projects, each teacher presented an impressive account of their own professional development and of follow-up work in their schools, and these held equal status with our own contribution to the session. Engaging teachers in other forms of joint publication will admittedly be more difficult without dedicated time and support; however, the six of us recently co-authored an invited article illustrating the project outcomes, to appear in a publication on interactive whiteboards distributed to all schools in Australia and New Zealand. While time pressures inevitably constrain the sharing of our co-inquiry model and other outcomes in more interactive ways, we believe there are wider practical implications for continuing professional development. Thus, while this paper has foregrounded the outcomes for the research collaborators and alluded to spin-off effects within the schools, intermediate theory – in general and the form developed here – may have useful messages for practitioners and researchers elsewhere too.

**Extending the co-inquiry outside the partnership**

Possibilities arise within other research partnerships with different pedagogical concerns for adopting or adapting the process of collaborative theory building itself. While there is no expectation that others will adopt our approach wholesale, considering the issues emerging may be helpful in designing new forms of collaboration. We might aid others by drawing out in this section some generic messages about the preconditions and critical features of our evolving approach and documenting the specific kinds of support and stimuli we offered. That is the final goal of this paper.

First, we acknowledge that success depends upon teachers being willing to engage both in and with research (Elliott, 2004) and having dedicated teaching release time. It was particularly important in our study to provide encouragement and funded time for both lesson planning (Jaworski, 2007) and the diary writing that helped individuals to formulate their perspectives, responses, questions and plans for themselves, and thus to make them explicit to all of us. Remarkably deep reflection went on during the internal dialogue that underpinned these externalized thoughts (Säljö, 1995), particularly in post-workshop diaries. Complementing those personal records, notes circulated from team discussions and interim versions of the tables served to document our evolving shared interpretations of dialogue, offering an important resource for our analyses and for teacher projects.

Ideally, all teachers would have time to participate in the kinds of critical reflection, classroom inquiry and in-depth analysis of practice described here (coupled with accreditation). In the real world, few presently have that luxury, hence posing a key ethical concern (Hennessy & Deaney, 2009b). Even where funding is secured,
appropriate substitute teachers are not always available. In our study, the reward on investment was high in the sense that there were substantive outcomes from a relatively short intervention (compared to the learning communities developed over a couple of years by Goodchild, 2007; Jaworski, 2007, for instance), and it seemed that sufficient momentum was built up to enable the development of dialogue to continue independently within the schools. However, our teachers were carefully selected, and others may need more time to achieve as much. The three teachers were already skilled at dialogic practice and they held subject or school leadership roles; thus they were well placed to lead further activity and to argue the case for a new approach. Less experienced teachers may find it beneficial to engage other, ideally more senior, colleagues in this endeavor, and vice versa. But if motivated by addressing themes of known mutual interest, as our teachers were, then we believe that they can benefit equally.

The T-MEDIA follow-up work by Hennessy et al (2008) encourages us to believe that careful representation of our current versions of substantive outcomes might spark further cycles of inquiry involving much larger numbers of teachers working with school colleagues rather than with outsiders, and with more limited professional development time. That study also showed that lower levels of prior experience with teaching and with the particular technologies and approaches being explored (as compared with the original teachers) were not a significant obstacle; most practitioners seemed to want to improve their practice and if supported were willing to experiment and learn from feedback (Leat, 2009). The professional development model we evolved in that study led to significant reported change after only 3 weeks, albeit with 7 hours per teacher of funded time for discussion and peer observation. A conducive school ethos and leadership team are clearly influential in determining whether such research and professional development activities are able to take place and how their outcomes may be sustained and developed further over time. We therefore strongly urge school leaders to consider the longer-term value that intensive bursts of collaborative activity can yield in terms of both pedagogical shake-up and a more reflective outlook by participants.

Research is only one possible route, of course, to development for teachers. Important and more easily scaleable benefits may also be derived from more modest forms of activity. These include self-reflection and personal engagement with representations of intermediate theory and video recordings of others’ practice and in a teacher’s own classroom. Camcorders are now inexpensive, offering a useful professional development tool. Such reflection may inspire practitioners with any level of expertise to develop and test new pedagogical strategies. We feel, however, that peer support is both a catalyst for success and a critical motivator for participation in such development work in teachers’ own time. While some will be self-sufficient, informal collegial interaction in between lessons with some shared free time to review material together is probably a minimum prerequisite for most practitioners, along with open-mindedness and access to the kind of stimulus material described here.

Using intermediate theory to support wider changes in practice

Finally, we reflect on how the new practices and pedagogies derived from collaborative theory building might be effectively shared with others who have not engaged in the process. McIntyre (2005) points out that before they are welcomed by school managers, practices have to be validated in terms of educational merits, cost-effectiveness, social acceptability and general practicality. Recognition of these and of unrealistic assumptions by educational researchers about “dissemination” to practitioners (documented by Brown, 2005; Hargreaves, 1999) leads us to stress that it does not denote a straightforward imparting of findings and “uptake” of new practices, guidelines or “application” of new ideas. Rather it means laying them open to critical scrutiny and modification for new contexts, as in the professional development materials arising from T-MEDIA. Likewise our aim here was modest in terms of offering ideas and exemplars that teachers might engage with in reviewing or researching their own practice and that teacher educators might draw upon accordingly.

McIntyre (2005, p.378) asserts that making practices useful to others necessitates “abstracting their key effective generalizable features from the enormously complex real personal practices of the individual teachers”. While we acknowledge that substantive results cannot be generalized from three case studies in diverse settings, the dialogue tables and critical episode criteria we iteratively formulated served to make some headway toward generalizing by abstracting the key characteristics of dialogue in the context of IWB use. They also summarize the principled pedagogy emerging from reflection and “critical alignment” with theories of dialogue and modes of practice through the inquiry process (Jaworski 2006), although
manifestation of the principles inevitably throws up quite different patterns in our three diverse contexts (Putnam & Borko, 2000).

Further related substantive outcomes are described in more detail elsewhere (e.g. Mercer et al., submitted): lesson materials and video footage illustrative of supporting dialogic teaching with the IWB, including rich exemplars of student dialogue. Collectively these might form the basis of a toolkit for professional development to stimulate analysis of underlying rationale and discussion of dialogic approaches between colleagues elsewhere, and hence development of reflective practice (and further refinement of theory) in other educational settings. The materials could also illustrate dialogic practices for pre-service teachers and stimulate them to think about which strategies they might want to try out themselves. Our next challenges are to represent the underlying theoretical rationale more explicitly and make the substantive outcomes more widely available; we are already working with our teachers to create the toolkit resources and share them with others (initially via a dedicated Faculty website at http://dialogueIWB.educ.cam.ac.uk). Such theory- and research-informed but practical tools, largely designed by and for practitioners, are more likely to have an impact on practice within schools than any reports or presentations we might produce—as long as we recognize that one-way distribution is equally unlikely to be effective.

Teachers are highly motivated by creating rather than just applying knowledge. Further contextualization will be essential, and public examination of our resources—indeed, dialogue with and about them—must be encouraged. We will build on the steps that all of our teachers have already taken to share the work with colleagues during ongoing staff meeting discussions, thereby working towards wider changes in practice through further developing and testing principled pedagogy, gaining feedback and continuing to refine the tools they have developed over time collaboratively with their peers. For instance, Diane has already spontaneously drafted a school Teaching and Learning policy action plan outlining how the critical links between theory and practice would be made, and the two-way nature of their interaction is encapsulated in her second step: “How does dialogic teaching and the dialogue table in particular fit in with our approach to teaching and learning (or vice versa)?” Building on existing practice is explicitly incorporated in her dialogic teaching “audit” (based on the dialogue table she developed), and in plans to “share qualities of dialogic teaching [and IWB uses] already evident in our teaching.”

Any number of interventions might be designed to embody a particular theory; thus using multiple examples may ultimately help teachers to mindfully abstract and understand the underlying pedagogical principles (Randi & Corno, 2007, p.336-7). Teachers may appropriate any or all of the dialogic principles we formulated—in line with their personal goals—and use them to analyze or shape practice in new settings. However, and crucially, we do not assert that they are relevant in all other settings. They are nonprescriptive, and combined with specific examples in the video records they offer mere illustrations that may help teachers to get a handle on what dialogic interaction might actually look like in a small but diverse range of settings. The rest of the cognitive work has to be left to practitioners, to make links for themselves with and across their own settings. Our dialogue and dialogic pedagogy tables are adaptable by teachers using similar or alternative digital or non-digital tools and resources, across classrooms, curriculum subject and topic areas, with different ages and kinds of students, and for use and adaptation by students themselves. This furthers evolution of the kind of generalizable explanatory theory that teachers need to guide their own practices (Nuthall, 2004).

The design principle here is consistent with Leat’s assertion that ‘research products need to offer a density of connected ideas through which schools can create their own trajectory of change’ (Leat, 2009, p.19). Involvement in the inquiry process facilitated our teachers’—and in turn their colleagues’—understanding of the theoretical principles underlying classroom dialogue and how and in which situations they might be applied, and conversely, of how curriculum or practice might be adapted to pertinent aspects of the theory and to new resources available (Bransford & Schwartz, 1999; Randi & Corno, 2007). The latter involves practitioners themselves identifying teaching problems that might be solved through applying theoretical principles.

In conclusion, we may be able to shortcut the process of building intermediate theory from scratch by offering representations of principled pedagogy that form a springboard for further critique and iterative refinement of intermediate theory and the materials that embody it, as these are investigated through action research in new contexts by other practitioners. We recognize that applying findings from collaborative research in the classroom is as complex as generating them and conceptualize this as a dynamic and recursive
process of dialogic interaction between research-informed theory and classroom practice, as well as between academic and school-based researchers.

ACKNOWLEDGEMENTS

We are hugely indebted above all to the three teachers who willingly participated in this study and from whom we learned so much. Likewise colleague Rosemary Deaney contributed enormously to the original development of the T-MEDIA project methodology and the follow-up studies. The work of our esteemed late colleague Prof. Donald McIntyre provided many further valuable insights. The incisive comments of Barbara Jaworski on an earlier draft of this article were highly informative, and feedback from Kenneth Ruthven, Lyn Corno and the anonymous reviewers was extremely helpful too in shaping the write-up. We also appreciate the truly inspirational input of Chris Tooley and the efficient secretarial assistance, data transcription and coding undertaken by Bryony Horsley-Heather. The work was funded mainly by the UK Economic and Social Research Council (ref. RES063270081) as part of a Research Fellowship programme of work carried out in 2007–09 by Sara Hennessy. A research development grant from the Faculty of Education funded the research assistance helpfully provided by Silvia Stetco-Belknap.
REFERENCES


Table 1
Phase 1: Activity in Day Workshops 1–3

<table>
<thead>
<tr>
<th>PHASE</th>
<th>ACTIVITIES</th>
<th>PURPOSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Pilot filming of 2 lessons with target class.</td>
<td>Community building (Jaworski, 2007); familiarisation of whole team with all teachers’ existing classroom practices and students; construction of shared understanding of their approaches to supporting dialogue and discussion of what seemed effective.</td>
</tr>
<tr>
<td>1b</td>
<td>Workshops begin, employing range of resources as stimuli for reflection upon practice: <em>commenting &amp; reflecting on teacher-selected pilot video extracts.</em></td>
<td></td>
</tr>
<tr>
<td>1c</td>
<td><em>Researcher presentations:</em> managing dialogic teaching and learning (Warwick); strategies for engaging students in using the IWB (Hennessy); “exploratory talk” and “talk rules” (Mercer); illustrations from professional development activities generated by ‘Thinking Together’ research on development of classroom language and reasoning (Dawes, Mercer, &amp; Wegerif, 2004; Mercer &amp; Littleton, 2007).</td>
<td>Formulation of thinking about issues such as students’ use of the IWB versus spectatorship, use of nondigital mini-whiteboards to engage all students, ‘added value’ of the IWB and status as a tool, role of talk in a multimodal context, importance of creating a supportive environment for dialogue, need for explicitly developing reasoning skills.</td>
</tr>
<tr>
<td></td>
<td><em>Viewing video clips and transcripts from our previous research,</em> including 3 T-MEDIA CD-ROMs; footage from ‘Dialogic Teaching in Science Classrooms’ (Mercer &amp; Scott, 2007) and ‘IWBs as Pedagogic Tools in Primary Schools’ (Gillen, Kleine Staarman, Littleton, Mercer, &amp; Twiner, 2007)</td>
<td>Evaluation of illustrated approaches and applicability to teachers’ own contexts; discussion of ways of further exploiting IWB technology to enhance their own approaches.</td>
</tr>
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<td></td>
<td><em>Distribution of literature:</em> short article on questioning strategies (Cardellichio &amp; Field, 1997); Futurelab report on IWBs (Rudd, 2007), Alexander’s (2004) treatise on dialogic teaching; Mortimer and Scott (2003) chapter; Lloyd’s own lesson observation coding scheme based on the latter framework (see Hennessy &amp; Deaney, 2009b).</td>
<td></td>
</tr>
<tr>
<td>1d</td>
<td>Exploration and iterative refinement of notions of ‘dialogue’ and pedagogical strategies for using IWB to facilitate it, developed during each workshop and then</td>
<td>Capture of our collective ideas as they were generated, refined and integrated, within two constantly</td>
</tr>
</tbody>
</table>
through interaction with data (ongoing negotiation of phrasing).

Unstructured diaries kept of teacher reflections on each workshop experience. Audio-recording, partial transcription or summarizing of workshop discussions.

1e Technical input from an IWB-experienced expert (science) teacher (Chris) – extensive dialogically-oriented demonstration of using sophisticated IWB features in the classroom; subsequent availability for one-to-one technical assistance. (To tailor the input, participants’ existing and desired IWB skills and access to equipment were surveyed beforehand.)

1f Design of mini-modules of IWB-supported work (during and after Workshop 3) that encompassed the dialogic principles embodied in our tables, fit within the curriculum and teachers’ current teaching schemes, and were adaptable to other contexts.

Documentation of evolving shared interpretations of both dialogue and process of our collaboration.

Documentation of evolving shared interpretations of both dialogue and process of our collaboration.

Development of teachers’ technical expertise and increased range of features available for exploitation; continuing support during subsequent lesson planning where desired.

Activation of evolving dialogic theory within teaching practice; exploration of flexible, learner-responsive approaches.

Note. Activities are not all sequential as some phases overlap, for example 1d was ongoing throughout the project.
Table 2
Examples from team representation of ‘dialogue’ in the IWB context

<table>
<thead>
<tr>
<th>1. Climate/conditions</th>
<th>2. Potential skills/approaches/characteristics</th>
<th>3. Leading to . . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supportive environment for risk taking</td>
<td>Collective reflection</td>
<td>Makes reasoning explicit</td>
</tr>
<tr>
<td>Teaching approach that foregrounds dialogue and gives students responsibility for their own learning</td>
<td>Mutual questioning</td>
<td>Supports co-construction of knowledge-and-understanding</td>
</tr>
<tr>
<td>Teacher has relevant subject knowledge</td>
<td>Sharing ideas &amp; appreciating other perspectives (listening)</td>
<td>Develops new shared understandings</td>
</tr>
<tr>
<td>Suitable tasks for group work</td>
<td>Exploring different views – sometimes aiming at common understanding</td>
<td>sum of parts) and personal understandings/meanings/knowledge</td>
</tr>
<tr>
<td>Shared purpose and ‘ground rules’ of talk (includes willingness to accommodate others’ views and to change one’s mind; tentative (Ss &amp; T))</td>
<td>Evaluating own ideas and solutions against others’; giving reasons for agreement/disagreement</td>
<td>Appreciation that there are a number of different valid views – sometimes synthesis</td>
</tr>
<tr>
<td>Opportunities to sustain dialogue over time (maybe across lessons)</td>
<td>Critical but constructive</td>
<td>Improved dialogue skills</td>
</tr>
<tr>
<td>Familiarity with using range of IWB features and resource</td>
<td>Internal dialogue including comparing activity at board with own thought processes / ideas &amp; experiences / outcomes of group discussion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multimodal dialogue: student annotation, drawing, sorting, linking, manipulation etc.; other objects can convey meaning / understanding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multimodal dialogue away from IWB: (group) outcomes in form of diagrams/drawings/ordered elements, or on mini-whiteboards</td>
<td></td>
</tr>
</tbody>
</table>

*Note. Characteristics in bold font are our original table headings before Diane suggested those depicted. Characteristics were originally colour-coded to illustrate linked themes.*

Table 3
Examples from Diane’s rephrased table for colleagues: Using the IWB to support the development of dialogue in the primary classroom

<table>
<thead>
<tr>
<th>In my classroom, we…</th>
<th>You will see us…</th>
<th>So that we can…</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Sara Hennessy, Paul Warwick and Neil Mercer</th>
</tr>
</thead>
<tbody>
<tr>
<td>take risks and experiment by trying out new teaching approaches; creative approaches; carefully chosen resources; groupings; pupil-led learning</td>
</tr>
<tr>
<td>encourage children to be responsible for their own learning; children involved in setting success criteria &amp; selecting ways of working</td>
</tr>
<tr>
<td>use good subject knowledge and awareness of our children’s needs to help us use children’s contributions to advance the dialogue taking place</td>
</tr>
<tr>
<td>value talk in our lessons and plan for it to take place</td>
</tr>
<tr>
<td>are willing to sometimes change our minds Teacher and other adults model this; children encouraged to articulate it also</td>
</tr>
<tr>
<td>continue a dialogue over time, from lesson to lesson; planning takes account of this; teacher skill in maintaining continuity/recapping</td>
</tr>
<tr>
<td>use a wide range of IWB features and resources to stimulate, enhance and record aspects of our learning <strong>Teacher and children able to select and confidently use features most appropriate to need</strong></td>
</tr>
<tr>
<td>sharing, discussing, commenting on and exploring our views and ideas</td>
</tr>
<tr>
<td>asking each other questions</td>
</tr>
<tr>
<td>showing that we consider other people’s views</td>
</tr>
<tr>
<td>sometimes trying to reach a shared understanding by building on what people say</td>
</tr>
<tr>
<td>giving feedback and responding in a helpful way; being a ‘critical friend’ using what we already know to help us</td>
</tr>
<tr>
<td>reasoning and thinking aloud</td>
</tr>
<tr>
<td>telling each other what we have learnt when we have been thinking by ourselves</td>
</tr>
<tr>
<td>using classroom resources, including the IWB, in different ways to help us in our learning</td>
</tr>
<tr>
<td>saying why we agree or disagree with an idea</td>
</tr>
<tr>
<td>extend and refine what we already know</td>
</tr>
<tr>
<td>explain our reasoning clearly; improved speaking &amp; listening skills; children are used to expectations of extended answers/ explanations</td>
</tr>
<tr>
<td>help each other to understand things in a new way try to come to agreement express a range of views this is seen in the way in which children express their views and in how they receive and respond to the views of others</td>
</tr>
</tbody>
</table>

*Note. Text in bold italic font exemplifies the guidance Diane added in for her colleagues under each entry in Columns 1 and 3.*
Interactive whiteboard systems comprise a computer linked to a data projector and a large touch-sensitive electronic board displaying the projected image; they allow direct input via finger or stylus so that objects on the board can be easily manipulated by teacher or students. One can annotate directly onto a projected display and save annotations for re-use or printing.


The Specialist Schools Programme (http://www.standards.dfes.gov.uk/specialistschools/) helps schools, in partnership with private sector sponsors and supported by additional Government funding, to establish distinctive identities through their chosen subject specialisms.

There was a single (mobile) video camera on a tripod, usually positioned facing away from the windows at the side of the classroom to minimize intrusion and to avoid backlighting. (One teacher commented that this camera angle made it easier to see and evaluate the activity from a pupil's perspective, as he was keen to do, when reviewing the videos, whereas placing the camera right at the back as we had done in T-MEDIA yielded “a slight feeling of detachment”.) The teacher wore a radio microphone and a second radio microphone was positioned near students on the other side of the classroom. Ethical issues raised by Powell et al. (2003) pertaining to video in classrooms were addressed. In particular, informed consent was obtained from students and parents or carers.

This device exploits hide and reveal functionality and creates suspense during activities in which students make predictions then objects are dragged and dropped ‘into’ a square box and immediate feedback is given about their pre-classified properties, e.g. true/false, prime number or not.

Theoretical issues concerning different perspectives on dialogue were again beyond the scope of this paper, however they are elaborated in the paper in preparation by Hennessy concerning the nature of dialogue in the multimodal context of IWB use, and the role of digital artifacts as interim records of dialogic activity. The paper draws particularly on the work of Wells, Jewitt, Wegerif, Bakhtin and Hakkarainen.