



Reclaiming thinking: Dialectic, dialogic and learning in the digital age

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This paper examines and reflects on a selection of approaches to technology enhanced learning that focus on the promotion of contemporary interactions and thinking to propose a new approach to understanding, supporting and designing learning dialogue. It presents an original anatomy for learning processes and practices in the digital age that is articulated in terms of dialectic and dialogic dimensions of dialogue. We hold that these dialectic and dialogic processes (interpreted broadly) are a primary 'engine' for stimulating and supporting the collaborative development of knowledge, meaning and understanding in ways that promote deep learning in most educational contexts. The argument presented in this article includes reviews of the authors' previous work which encompasses philosophical foundations, sociocultural psychology, empirical studies and design-based research methods. After presenting related perspectives and examples that substantiate our 'dialectical and dialogical stance', we will summarize its significance and the implications for designing technology enhanced interactions that stimulate thinking, conceptual development and engaging learning. One major implication is that we need to build on these types of detailed theory-led examinations to improve our theorizing about the key features of the anatomy of effective and meaningful learning interaction and dialogue that are important in the digital age.

Background: Reclaiming thinking

This paper examines and reflects upon a selection of approaches to technology enhanced learning that focus on the promotion of contemporary dialogue, interaction and thinking to propose a new approach to understanding, supporting and designing learning dialogue within the digital landscape. This emphasis provides a deliberate contrast to current large-scale 'e-learning' initiatives in the UK such as BBC Digital Curriculum (BBC DC), Curriculum On-line, National Learning Network (NLN) and the Joint Information Systems Committees (JISCs) work into repositories and Managed

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Learning Environments (MLEs). As yet, most of these initiatives have emphasized the availability and reusability of media content to the detriment of a careful consideration of the role of dialogical and social processes that are needed for learning and conceptual development. We argue that in the same way that opening a library does not by itself lead to a more literate local community, these initiatives based around the openness and availability of learning content have rarely demonstrated or led to noted improvements in learning processes or outcomes. Indeed, one exception that has demonstrated improvements in outcomes uses interactive content within a blended learning paradigm (Boyle, 2005) and is currently emphasizing the development of communities for use and reuse (see www.rlo-cetl.ac.uk).

In contrast to this somewhat exaggerated emphasis on ‘interactive content’, we hold that dialectic and dialogic processes (interpreted broadly) are a primary ‘engine’ for stimulating and supporting the collaborative development of knowledge, meaning and understanding in engaging ways that promote deep learning in most educational contexts. Or as Kirschner (2006) would say ‘learning is interaction’. The argument presented in this article presents an original review and synthesis of previous work of the authors to present a position encompassing philosophical foundations (e.g. Socrates, Hegel), sociocultural psychology (e.g. Bakhtin, 1986; Vygotsky, 1986), a large number of empirical studies and design-based research methods (Hoadley, 2004; Sandoval & Bell, 2004). We start by qualifying our definition of dialectic and dialogic in ways that justify the centrality of these characterizations within the learning process.

Why dialectic, dialogic and design for learning?

The following subsections will define dialectic and dialogic as they have been understood in relation to learning. We will point out the relevance of these two characterizations of the dialogue process and demonstrate them before refining the relevance of their distinction with regard to designing for highly interactive and engaging learning.

Dialectic and learning

The dialectic that was used by Socrates (470–399 BC) during what has become known as ‘the Socratic method’ is one of the earliest recorded educational approaches. This has remained an inspiration to contemporary approaches to learning, such as computer-based *tutorial learning* proposed by Bork (2001), that he offers as the most important learning model for the twenty-first Century. The essence of the method is that through careful questioning by the teacher, students can come to realize the truth of a situation without being told it directly. For Socrates argument and learning was embedded in these real dialogues.

Hegel (1770–1831) turned dialectic into a more abstract notion of a dynamic logic proceeding from thesis to antithesis and then synthesis. Hegel’s (1975) approach rested on a coherence theory of truth, where the truth relies not only on a single proposition but also on a whole system of propositions, and only within this complete system can contradictions be recognized and falsity removed. Similarly, the process of synthesis preserves the rational and removes the irrational but then also provides another thesis that can become the subject of the same triadic process, and so on. So for Hegel, although ‘The true is the whole’, this is an evolving whole that develops through contradiction. Hegel also claimed that dialectic was a hidden logic behind the

movements of history. Marx took up Hegel's dialectic but, as he claimed, 'turned it on its head' to argue that the dynamic logic of history was driven by the needs of material production. Marx's historical materialism is a long way from the real dialogues of Socrates but it is largely in this form that dialectic has been influential on more recent areas of sociocultural psychology, such as the work of Vygotsky (1986) and Engstrom (1987).

Applying Hegel's dialectic Marx argued that culture and consciousness arise as 'tools' in the dialectic interaction between humans and nature. Vygotsky took this as a model of how an individual consciousness is formed through the internalization of tools. Hence Vygotsky's (1978) theory of the development of higher mental processes can provide a foundation and inspiration for approaches to technology enhanced learning that emphasize the necessity for collaborative, argumentative and reflective discourses. Although he conceived learning as an instructional process aimed at 'transforming the mind of the child into that of an adult', it is accepted nowadays that his ideas can equally apply to any relevant situation involving a learner and a more learned other. This 'more learned other' may be a teacher or a more capable student - which is often the case in higher education settings. For brevity, the word 'tutor' will be used in this paper to refer to the person that is considered 'the more learned other', who may be a teacher, a more capable student or a mentor. Similarly, Vygotsky's theory is not bound to the traditional concept of a school but can be applied more generally to contemporary learning that may be more informal and involve on-line communities.

Vygotsky draws a clear distinction between lower level mental processes, such as elementary perception and attention, and higher level mental processes that include verbal thought, logical memory, selective attention and reasoning. He argues for a qualitative distinction between these two-levels of mental performance, because unlike lower level activity, the higher level is mediated through cultural symbols and tools, self-regulated rather than bound to a stimulus context, social in origin and the result of conscious awareness rather than an automatic response. Critical in distinguishing higher and lower level activity is the qualitative developmental transition that occurs when language, or any other signification system, is internalized to operate as a mediating factor between environmental stimuli and an individual's response. This mediation transforms the lower level activity by lifting it onto a higher plane and can be achieved through the application of material or psychological tools. Further, in using such tools, we become conscious and in control of our mental activities. Vygotsky considered language to be the most interesting and powerful of these semiotic mediators and the primary tool for thinking. He claims that these higher mental functions originate in the social. Development proceeds 'from action to thought' and therefore communication and social contact are essential. It is through the communicative process that external signification systems conveying interpersonal communication become internalized, to operate as intra-personal psychological tools that transform mental functioning. In other words, internal language and thought are transformed from the 'outside'. This idea is critical to Vygotsky's notions about conceptual development and the evolution of linguistic meaning as we develop our higher level mental processes.

Dialectical dialogue games supporting conceptual change in science

Building on these Vygotskian ideas, Ravenscroft and colleagues (e.g. Ravenscroft, 1997; Ravenscroft, 2000; Ravenscroft & Hartley, 1999; Ravenscroft & Pilkington, 2000) followed a design-based research approach (Hoadley, 2004; Sandoval & Bell, 2004) to

develop a dialectical pedagogy for conceptual change in science. This supported a process of collaborative argumentation conducted according to a Socratic style *facilitating* ‘dialogue game’ implemented in the CoLLeGE (Computer-based laboratory for Language Games in Education) dialogue modelling tool.

This dialogue game approach was specified in terms of: the *goals* of the interaction (express and refine a consistent explanatory model in this case); the *roles* of the participants (e.g. discussant, facilitator); the intentions, or *moves*, that may be performed (e.g. Assertion, Question, Probe, Resolve¹); and, the *rules of interaction* (e.g. about turn-taking and the legitimate sequencing of moves). In this game these features were linked to a knowledge base, or domain model, representing the correct qualitative physics and a dialogue strategy. So this dialogue game and dialectical pedagogy involved the tutor-participant playing the role of an intelligent facilitator (FT in the extracts below), that used a qualitative model of the correct and consistent physics (as modelled by CoLLeGE) to guide their selection of argumentative dialogue tactics. These tactics stimulated the students to address their alternative conceptions, or misconceptions, in order to develop a complete and consistent explanatory model of the ‘correct’ physics. In other words, through participating in this dialogue game, the students were stimulated to develop an improved understanding of the physics of motion.

An extract taken from one of the dialogues in this empirical study, that involved a student (S11) explaining the physics of motion based on the scenario of ‘a person pushing a trolley’, is shown below (see Ravenscroft & Pilkington, 2000). This demonstrates how the dialectical approach employed by a facilitating tutor (FT) used argumentative tactics that addressed a student’s alternative conception, or misconception, of a ‘push implying motion’ (rather than the correct conception of a net push causing a change in motion). This led to a contradiction with their later correct explanation for the equilibrium condition, i.e. when a push is equal to friction, that they said was required for the trolley speed to be constant.

- S11. *Assertion*: Push greater than friction causes the speed to be constant.
 FT. *Probe*: What is the consequence when push less than friction?
 S11. *Assertion*: Push less than friction causes the speed to decrease.
 FT. *Probe*: What is the consequence when push equal to friction?
 S11. *Assertion*: Push equal to friction causes the speed to be constant.

Then, after the tutor probed for another explanation for when the push is greater than friction the student provided a consistent, but (another) contradictory explanation ‘push greater than friction causes the speed increase’. The student was then asked to *Resolve* this explicit contradiction between their latest explanation and their previous one (that was the first assertion in the extract above). They subsequently *Withdrew* the inconsistent assertion, leaving a consistent explanatory model.

- FT. *Resolve*: resolve contradiction, same causes, different effects,
 push greater than friction causes the speed constant,
 push greater than friction causes the speed increase.
 S11. *Withdraw*: push greater than friction causes the speed constant.

¹ Note that a number of lower level tactical options expressed the actual surface-level realisation of the dialogue moves, but this level of complexity is not given for the purposes of this paper but is well documented in the other papers that are referred to.

If these tactics had proved unsuccessful – a *Persuade* tactic may have also been adopted, that was successful with another student who had the same alternative conception:

FT. *Persuade*: Push less than friction causes the trolley speed to decrease [a repeat of a student statement]

Isn't it the case that a push equal to friction is a condition for trolley speed constant? to which the student agreed, asserting;

S. *Assertion*: Push equal to friction condition for trolley speed constant

These and other studies (e.g. Hartley, 1998; Ravenscroft & Matheson, 2002) have clearly demonstrated the necessity for a dialectical dialogue to support conceptual change in science. All these projects delivered stable conceptual change that was an improved understanding of the physics of motion (which was retained in delayed post-tests). This occurred where students had initially shown incorrect alternative conceptions despite already being taught the appropriate physics in their conventional school settings. Although these projects focused on problems of conceptual change in physics, it was proposed that this dialectical approach, of collaboratively arguing towards a consensual or correct conceptual understanding of a topic, could lead to greater understanding than conventional 'teaching' for many subjects (Ravenscroft, 2007). This insight led to a generalization of the approach, to produce a more powerful, flexible and adaptable dialogue game authoring tool called InterLoc (Ravenscroft & McAlister, 2006a, b; www.interloc.org) which currently allows a range of dialogue games (i.e. for critical discussion and reasoning, exploratory dialogue and creative thinking) to be implemented to address more generic problems associated with the development of dialogue and thinking skills and participation in practices of collaborative discussion and inquiry. This ongoing approach is demonstrated and discussed later.

Dialogic and learning

Bakhtin (1986), a contemporary of Vygotsky, went back to the Greeks to argue that dialectic had become over formalized and we needed to return to real dialogues. He said dialectic is a dynamic form of logic leading all apparent differences to be subsumed into identity in the form of a more complexly integrated synthesis. Bakhtin argued that logic itself has no meaning, it is only the clash of different voices that gives meaning. He opposed what he called 'Hegel's monological dialectic' with his notion of dialogic that referred to the interanimation of real voices where there is no necessary 'overcoming' or 'synthesis' (Wegerif, 1999). Following Wertsch (1991) the sociocultural approach has tended not to recognize this and instead has combined together two notions of mediation, Vygotsky's account of mediation by tools including words as sign-tools (dialectic) and Bakhtin's account of mediation by the voices and perspectives of others (dialogic). While mediation by tools is not incompatible with mediation by the perspective of the other person and both happen in education, it is important to point out that these are very different kinds of mediation, which can be conceived as different dimensions, or features, of the dialogue process. For each participant in a dialogue, the voice of the other is an outside perspective that includes them within it. The boundary between subjects is not therefore a demarcation line, or an external link between self and other, but an inclusive 'space' within which self and other mutually construct

and reconstruct each other. Tomasello, Carpenter, Call, Behne, and Moll (2005), summarizing a large body of empirical research on development, affirm the primacy of establishing a dialogic relation between people to the development of human thinking. They specifically take on and reject the Vygotskian argument that it is the internalization of language use that develops human thinking, writing of dialogic skills:

‘What could it mean to say that language is responsible for understanding and sharing intentions, when in fact the idea of linguistic communication without these underlying skills is incoherent. And so, while it is true that language represents a major difference between humans and other primates, we believe that it actually derives from the uniquely human abilities to read and share intentions with other people’. (Tomasello *et al.*, 2005)

So the dialogic approach to learning emphasizes that the main mechanism for learning is taking the perspective of another in a dialogue. It also suggests that induction into dialogue is a way of teaching general thinking skills such as creativity and learning to learn (Wegerif, 2005). With this approach dialogue is an end to be valued in itself as perhaps the most important goal of education. This dialogic approach arose partly out of a re-interpretation of what was happening when children are inducted into more effective classroom dialogues. Experimental studies suggested that teaching exploratory talk could lead children to perform better on reasoning tests when working in groups (Wegerif, 1996; Wegerif, Mercer, & Dawes, 1999). Initially this was theorized as an effect of using language as a tool for explicit reasoning. However, re-analysis led to the claim that the key factor was not the way that words were used so much as the increasing capacity to take the perspective of others and of the generalized other, implicit in the dialogue (Bakhtin’s notion of a ‘witness’ or ‘superaddressee’) implying that the most important indicator of improved reasoning, was not the use of explicit reasoning but the ability to change one’s mind and see things from a new perspective (Wegerif, 2005).

Using Bubble Dialogue to support dialogic learning

One way in which computer interfaces can support dialogic reflection is to offer a kind of half-way stage between the ephemerality of talk and the relative permanence of written texts. This is part of what McMahon, one of the originators of Bubble Dialogue software, refers to as ‘slow-thrownness’ (McMahon & O’Neill, 1992). By this term he refers to the way that Bubble Dialogue can externalize the thoughts and feelings of the participants and allows these to be manipulated and to serve as a support for shared reflection. The Bubble Dialogue software is designed to support dialogues by converting them into a more enduring and yet flexible medium. At the heart of Bubble Dialogue is the simple idea of combining pictures with speech and thought bubbles. The pictures are easy to load into the software and can represent dialogues in any situation. In addition to the bubbles there is a facility to review the dialogue created so far, to change it and print it out. With McMahon’s encouragement Wegerif designed and developed a new multi-media version of Bubble Dialogue, Bubble Dialogue II, in which there is also an option to record speech so that children do not need to type but can talk instead (www.dialogbox.org.uk).

In one study Bubble Dialogue was used in a special school for children with emotional and behavioural difficulties. Such children can find it particularly difficult to articulate their own thoughts and feelings and to appreciate others’ thoughts and feelings. Previous studies at the Open University showed that Bubble Dialogue could be helpful here by making the characters’ thoughts (as well as their speech) objects for

Through using the Bubble Dialogue programme the children rehearsed a way to talk themselves out of a fight that at first seemed inevitable. This was done without conflict or stress because the youngsters spoke only through proxies, the Bubble Dialogue characters Joe and Greg. The focus here was on social learning. This was achieved through increased critical reflection supported by the combination of software and dialogue. The tools here are not directly mediating thought but serving as a catalyst for increased awareness and insight.

In contrast, one theoretical implication of Vygotsky's dialectic account of development is the progress away from participatory thought towards increasing systematic and rational thought, which he eludes to at various points (e.g. Vygotsky, 1986, p. 199). A dialogic perspective would resist this move to rational thought and suggest a development towards a greater capacity for engagement in participatory dialogue and so for learning to learn from others and for the creativity implicit in being open to the emergence of new ideas in a dialogue. However, in practice Mercer's re-versioning of Vygotsky's rather asymmetrical Zone of Proximal Development as an Intermental Development Zone emphasizes how both teachers and students enter into a dialogic space together (Mercer, 2000). Since dialectic had its origin in dialogue, it is entirely appropriate that it should now return from the abstractions of Marx and Hegel to refer to real open-ended dialogue in this way.

Whereas a neo-Vygotskian account of the role of networks in learning has often conceived of the relationship between technology and learning as a direct one, claiming that cognition is essentially mediated by tools, the dialogic perspective argues that cognition is essentially mediated by the perspective of others and otherness in general. Hence technology has a more indirect role in opening and resourcing dialogic spaces. This implies the need for pedagogy that can be described in terms of moving learners into the space of dialogue. Tools, including dialogue and computer environments such as InterLoc (Ravenscroft & McAlister, 2006b) that is described later, can be used for opening up and maintaining such dialogic spaces and also deepening and broadening these spaces (Wegerif, 2006).

Dialectic or dialogic? Relative dimensions for understanding the anatomy of learning dialogue

The previous sections have articulated and argued for a dialectic and dialogic approach to learning. But what is the relationship between these two characterizations? Do they work together or in opposition? The work of Ravenscroft and his colleagues in designing dialectical dialogue games for conceptual change in science (e.g. Ravenscroft & Hartley, 1996; Ravenscroft & Pilkington, 2000; Ravenscroft & Matheson, 2002) has shown that an argumentative approach needs to be used for a student and tutor to achieve a synthesis around a correct conceptual understanding, where the correct physics is indeed the 'hidden hand of logic' that is guiding the dialogue process. Wegerif (2006) has argued and demonstrated that in some circumstances, especially when dealing with younger children and those with emotional and behavioural problems, a more dialogic approach, with its emphasis on 'taking the perspective of another' is more important than progression towards some sort of synthesis around a common understanding. Considering this work collectively we hold that dialectic and dialogic are two relative dimensions that are not in opposition, as they focus on different yet equally important features of the dialogue process relevant to learning. Dialectic emphasizes the epistemic and cognitive dimensions of learning that are realized through social processes that

occur when an appropriate dialogic state is established. Dialogic emphasizes emotional and interpersonal dimensions, or the sort of 'relationships' and 'intersubjective orientations' that enable the spaces where learning can happen. These are a complementary emphasis. The desire to reason to progress towards a rational synthesis does not have to override the need to understand others, and likewise, the desire to understand others does not have to override the often pragmatic need to reach a rational consensus that links to purposeful action in a context. The two will always interplay and vary in emphasis based on what is wanted from a learning situation. Wegerif (2007) makes the claim supported by Tomasello *et al.* quoted earlier, that dialogic relations precede and exceed dialectic ones, as they are the necessary medium of reflection and therefore of understanding. On the other hand, the construction of useful cognitive artefacts and tools that embody shared understandings and carry them forward between dialogues occurs through dialectical processes. To paraphrase Kant (Kant, 1781/1982, A 51/B75): dialectic without dialogic is blind (as in machine cognition), dialogic relations without dialectic is empty of content (as in the mother child couple): it is through their union that new shared understandings can arise.

The following sub-sections present two examples of technology enhanced learning that are highly interactive and foster distinctive types of learning dialogue. These are two particularly successful lines of work that have received considerable funding and led to many publications (e.g. see Hartley, 2003 and Ravenscroft (2007) respectively for reviews). These initiatives are summarized and then considered in terms of dialectic and dialogic dimensions in line with the arguments developed above.

Structuring the space of dialogue with a simulation

CACTUS (Command And Control Training Using knowledge-based Simulations) was designed because developing conceptualizations and interpretive frameworks to understand complex dynamic situations, and to guide decision-making, is particularly difficult when judgements have to be made on partial or uncertain information. This situation is exacerbated when the consequences of decisions can be disturbed by unexpected contingencies. Epistemic games (or Simulations) are useful educational and training aids for these situations (Shaffer, 2006; Shaffer, Squire, Halverson, & Gee, 2005). These enable trainees to take on authentic responsibilities and attitudes, but in situations where complexity can be adjusted, and where the system, through its dynamic displays and record keeping provides not only opportunities for interaction, but also for discussion and reflection.

These processes are illustrated in CACTUS, a collaborative training project undertaken with the UK Metropolitan Police. This simulation involved the tactical and strategic management by Senior Police Officers of a large scale demonstration which could attract counter reactions, possibly leading to unrest and public disorder.

The simulation design and training experience

The computer display presents a visual scenario, namely a digitized map of Central London, on which the trainer/facilitator can: mark the designated route of the march; place icons (coloured green in the computer display) to represent the demonstrator groups (typically fifty groups of forty members, close enough in the march to influence each others' behaviours); and, mark significant buildings which could attract unwelcome attention *en route* (see Figure 2).

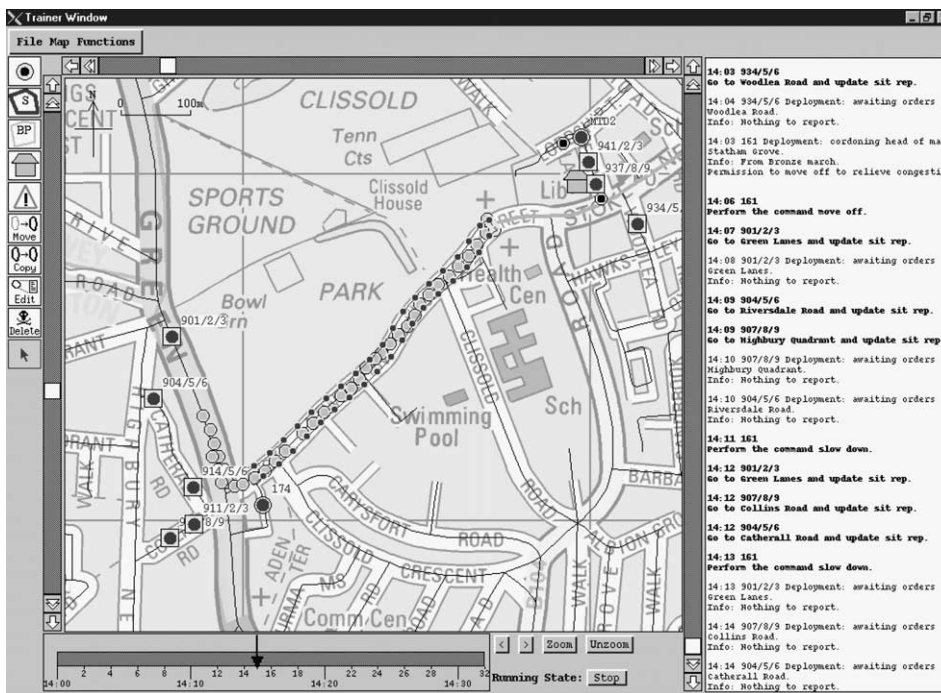


Figure 2. The initial stage of the march.

The crowd icons are agents with autonomous behaviours regulated under a probabilistic network which allows behaviours to escalate and de-escalate in plausible ways depending on what the groups sense, i.e. the behaviour state of adjacent groups, the tactics of nearby police units, the presence of hostile groups and 'significant' buildings (Hartley, 2003; Hartley, Ravenscroft, & Williams, 1992). These behaviours can vary from sitting down, dismantling barriers and causing minor disturbances, to throwing stones, other missiles, breaking out and attacking police or hostile groups. The simulation runs in pseudo real time, with the demonstrators progressing on the route with the behaviours for each group being recalculated every fifteen seconds. These crowd behaviours are referred to in the reports given by the police units (shown as blue icons) which appear on a communication log in the computer display (see Figure 2).

Senior Police Officers (the trainees) use strategies and tactical actions to manage the march, protecting the right to demonstrate peaceably. But this can be disturbed by hostile groups (shown as black icons) which gravitate on the map from their entry points, eg. Tube Stations, towards the march. The simulation operates under time-line control and keeps full records. Hence the simulation can be reconstituted by the trainer for any indicated time and can be rerun under different tactics to deal with a particular incident. So, the simulation proceeds dynamically, each scenario taking approximately two to three hours.

In monitoring the interactions on their system-displays, the trainers attached comments on the time-line for future discussion about the situation or tactics. In addition, the system was dynamically adaptive so the trainer could introduce other hostile groups, bias the crowd behaviours or introduce extraneous incidents if latent weaknesses in the trainees' tactics needed to be more directly tested. The system

supported discussion during the simulation but, more importantly, in the reflective debriefing sessions at the conclusion of the exercise.

Evaluation and discussion of the CACTUS approach

This project has run for over ten years, with the simulation exercises recorded in detail over a two-year period. Both trainers and trainees considered them extremely useful, and their evaluation questionnaires gave high ratings (Hartley & Varley, 2002). Indeed, without computer-based facilities, such training in crisis management would not be able to be provided. The trainees, who were Senior Police Officers with experience in managing Public Order events, were unlikely to learn new tactics, rather the benefits arose out of interactions with the trainers and particularly in the post-exercise debriefing discussions.

In brief, the simulation exercises provided an epistemic framework (Shaffer, 2006) where not only explanations were given and examined, but also attitudes and values related to policing were elicited and articulated. Specifically, tactics came to be reviewed in terms of their appropriateness and whether they were properly prioritized in view of other circumstances in the scenario. Were the actions timely and were the events requiring these actions anticipated? Were the tactics adequately resourced, and effective? Such criteria were not formally identified or defined, but developed as interpretive themes. In the example shown in Figure 2, the march is heavily protected and resources have been directed to this objective. However, some trainees placed lighter resources protecting the march, with more resources of greater mobility ready to deal with hostile groups and prevent them getting near the march. There was no clear answer, but the discussion disclosed these issues and brought them to the fore, preventing one particular view obscuring alternatives.

These discussions had an openness that resulted from participants agreeing on matters at issue, and with a common aim of interpreting and seeking to understand the management of critical incidents. The simulation provided the means and support to disclose views and differences which provided a stimulus to seek a common framework and Vocabulary so that different conceptions could be engaged (Gadamer, 2006). Achieving a communality of understanding does not imply that trainees agree on a specific tactic in a particular situation. They commonly held to their original decision. However, the Vocabulary of the demonstrator behaviour and tactical actions allied to the framework of the tactical and strategic criteria could accommodate different views and ensure they were translatable the one to the other. So that participants through comparison and contrast could develop a greater understanding of the alternative tactics and strategies that could be utilized (Hartley & Varley, 2002).

Although simulations of this complexity require considerable resources, simpler scenarios have been developed under epistemic discussion frameworks with medical and engineering students, which were found to have similar benefits (Parker-Jones & Pilkington, 2002; Pilkington & Parker-Jones, 1996).

Dialectic and dialogic dimensions

The CACTUS activities demonstrated an interesting combination of dialogic and dialectic features. The scenario created and legitimized a space of debate between Senior Police Officers and their trainers that would have been difficult, or may be impossible, to establish without the simulation tool. However, this space of debate was

usefully constrained and focused through sets of strategies and tactics based on a common semantics and taxonomy, in a linguistic sense. This tactics Vocabulary of CACTUS provided the focus around which dialogue could be, and was based. The Strategies formed the evolving and coordinating themes around which understanding (and differing opinions) became linked and translated. This creation of a closer common understanding of key tactics and their likely outcomes combined with the need to agree optimal plans or contingency plans demonstrated 'listening to the voice of the other' in order to, ideally, reach an understanding of the range of actions or decide a suitable action. In other words, a dialogic space was established in order to debate, argue and where possible converge on legitimate and agreed tactical options that could subsequently be tested. Of course, consensus, or synthesis, towards an agreed interpretation of events or plan was not always realized, but it was important that it 'hung there' as a pedagogical ideal or was part of a consensual set of possibilities. Along similar lines, trainers deliberately adjusted the simulation to address identified weaknesses in the trainees tactical plans, to guide them to a better understanding of tactical possibilities and possible outcomes.

Digital dialogue games for engaging and conceptual learning

Building on earlier work of Ravenscroft and his colleagues (see Ravenscroft, 2007, for a review), McAlister, Ravenscroft, and Scanlon (2004a) showed that a dialogue game for critical discussion and reasoning, mediated by a tool called AcademicTalk, supported deeper and extended argumentation and reasoning in open and distance learning (ODL) students. These showed a more thoughtful and scholarly approach to learning and reasoning when compared with a less structured dialogue approach (i.e. synchronous Chat) addressing the same task (McAlister *et al.*, 2004a). This and other recent work into digital dialogue games (see Ravenscroft, 2007 for a review and www.interloc.org) has shown that this approach supports practising higher-order thinking and discussion skills, in a way that is unusually engaging, motivating and inclusive (Ravenscroft, McAlister, & Baur, 2006). The InterLoc tool is described in detail in Ravenscroft and McAlister (2006a, b). In brief, the current dialogue game approach that is implemented through Interloc allows students to play with, practice and develop their academic, dialogue and cognitive skills in an engaging and motivating way.

The InterLoc tool and interface: Connecting players and their conceptualizations

The key interface that currently mediates the dialogue game process is shown in Figure 3. This interface includes: a Select Activity window which organizes and locates the user within related learning activities (e.g. readings, asynchronous question setting, synchronous game interactions, summaries etc.); a Browse Messages Window that provides a number of options for viewing the total dialogue during an exercise (e.g. by topic, time or player); and, a Conversation Display which is the focus during the dialogue games. This intuitive design supports slick coordination between the argumentative sub-dialogues a participant is actively engaged in and the total message list that conveys the whole dialogue, and also fosters focus and coherence during the games. Collectively, these features produce high levels of engagement in the dialogue game process.

The brief excerpt in this interface, taken from a pilot test with postgraduate student teachers of Mathematics at the University of Southampton (see Figure 3 below), illustrates students engaged in coherent critical discussion using the InterLoc Critical Discussion and Reasoning game. This excerpt shows how predefined locution openers,

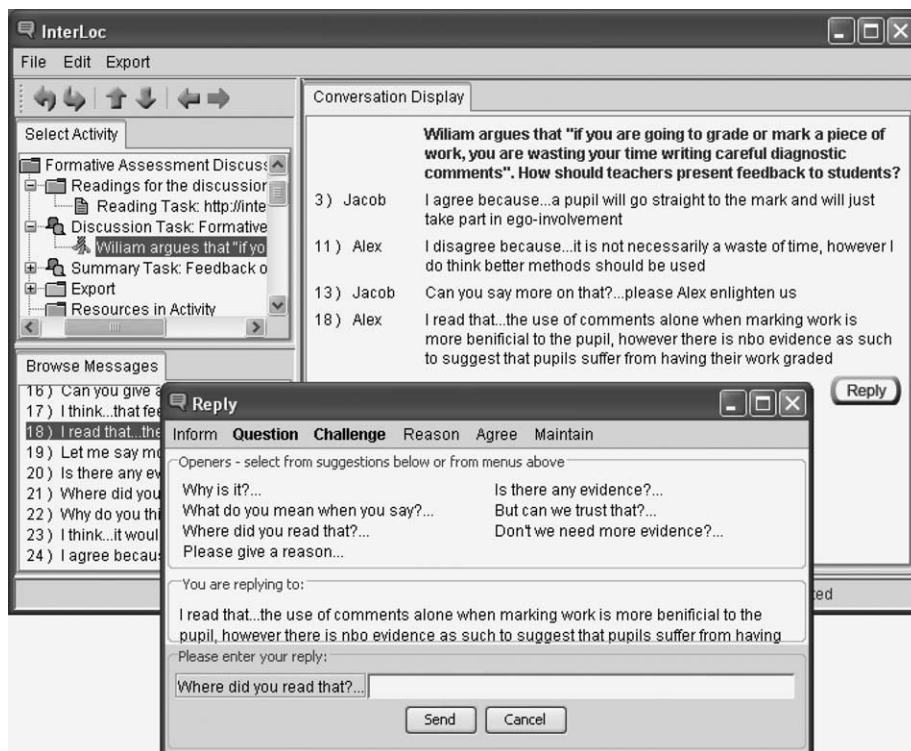


Figure 3. InterLoc interface during critical discussion and reasoning game.

and the logic they entail, are used to convey disagreement leading to an elaboration request that prompts justification through referring to evidence.

Jacob² starts this interchange using the Opener 'I agree because . . . ' to express his agreement to the predefined discussion question, about how students should receive feedback from teachers. This prompts Alex to disagree with Jacob's Assertion using 'I disagree because . . . ' to argue for better methods of feedback, than just presenting a mark. This stimulates Alex to prompt Jacob for some elaboration of his position using 'Can you say more on that . . . ', which prompts Alex to explain that he read some evidence to qualify and elaborate his position, which says that although commenting is beneficial there is no evidence that grading is harmful. This in turn prompts another participant, called Amy³, to request the nature of his elaboration using 'Where did you read that . . . '. Even this brief excerpt demonstrates how using InterLoc leads to a reasoned, coherent and yet varied dialogue, with players using a range of moves to create constructive conflict within a legitimate argument. Also, in this example Alex is clearly trying to argue his case and win the argument.

An important point to note about these dialogues, that has been demonstrated and emphasized in other articles (see Ravenscroft (2007) for a review), is that students are

² Note that in order to anonymise the contributions and yet retain the 'look and feel' of the interaction and gender – interlocutors are given an alternative name to their actual name.

³ As Amy is making her response, she is not yet recorded in the Conversation Display. This interface was reconstructed through loading the actual transcript.

clearly using predefined locution openers to structure an argumentative dialogue that is characterized by an informal, or linguistic, logic. And, although these interactions may lead to the exploration of different positions towards an elaborated understanding, this usually happens through each participant using the logical signifiers (the Openers) to argue for their particular position. In brief, they are clearly using these predefined linguistic features to reason and argue their case, with the aim of reaching a consensus or 'winning' the argument where possible. However, this logical impetus does not rule out the development of dialogue that results in differing reasoned positions.

Evaluation of the Interloc approach

The InterLoc tool and a Critical Discussion and Reasoning dialogue game have recently been pilot tested using an Action Research approach with a wide range of students at four UK Universities (e.g. Open and Distance Learners and Campus-based students). A summary of the key findings relevant to this article is given below, see Ravenscroft, McAlister, & Baur (2006) for a fuller account.

All students could perform the dialogue games through InterLoc quite fluently, with a number saying quite explicitly that it was better than other CMC approaches that had been used for a similar purpose. Overall, they felt positive about using InterLoc and enjoyed their experience, with most of them considering the dialogue games a 'useful' or 'valuable' exercise. Students remarked specifically on its usefulness with regard to 'cooperation, communication', discussion and the 'sharing of ideas' and views, and how 'the sentence openers made the dialogues more interesting'. In particular, they commented on how InterLoc promoted even contributions and a fair debate, allowing them to feel they could participate in legitimate critical discussions whilst still feeling 'safe'. In other words, they could freely express themselves and challenge others without the fear of personal 'attacks' or flaming. The way that this approach is highly valued by students who showed a lack of confidence and prior academic experience or were even 'afraid' of participating in group work involving critical discussion was a key finding from the pilot studies. In brief, it seems to empower less confident and less academically experienced students to participate in collaborative and critical inquiry that is meaningful to them and has significant educational value.

Although there were some reservations about the structure provided by the locution (sentence) openers, with some students saying they could not always find the 'exact' one for what they wanted to say, they often admitted, sometimes in the same comment, that considering the range of potential openers and being constrained to using one did 'make them think'. They felt that these features provided a helpful linguistic framework and believed familiarity with openers would improve their performance. Many students commented on how the openers guided thinking and allowed them to think more deeply about what they were going to say, preventing off-topic and tangential discussions.

The tutors identified a number of problems that using InterLoc helped them to address, which tended to echo the students' opinions. These included: the need to draw students into critically reflective dialogues on-line; overcoming inhibitions about challenging or disagreeing with fellow students' contributions; imbalance in contributions (in asynchronous conferencing some students do not participate, whilst a few others write long messages); and, openers are useful to make the students 'stop and think', and help to structure discussion. In particular, they felt it benefited students who would tend to unconditionally agree with peers in face-to-face interaction, as communicating through InterLoc supported active engagement in reasonable

argument. It was also described as stimulating motivation and active learning and all tutors found it very suitable for their purposes and were keen to use it again in the future. One tutor commented on initial concerns regarding the ‘game metaphor’, but in practice found it worked to separate student ‘ego needs’ from the activity and encourage enjoyment and serious engagement. This tutor also commented that InterLoc helped to move students on, from a stage where they felt embarrassed to state their opinions directly and to criticize others, to a situation where, through playing the game, they participated in collaborative and critical argumentation.

Dialectic and dialogic dimensions

The AcademicTalk and InterLoc tools show how linguistic features of a predominantly dialectical approach, such as the one originally embodied by CoLLeGE, could be developed into more dialogic ones that retain key features of a dialectic. A dialogic space for a group is developed through: a synchronous game design; ground rules for coherent sequencing of moves; and, perhaps most importantly, through the interface design legitimizing challenging, critiquing and questioning behaviours that may seem too impolite, conflictual or even ‘upsetting’ in more natural conversation. In brief, the dialogue game design opens a space of debate where all participants feel safe to propose, question and challenge ideas in a way that is free of personal attacks. In other words – it focuses interaction on the ideas that are in play rather than the person who is proposing them. The recent InterLoc pilot-studies have shown that students often overcome emotional barriers, such as shyness, discomfort or a lack of confidence to participate in these dialogue games and then enjoy and value the critical discussion they participate in. However, earlier studies have shown that once a dialogic space is established, the dialogues usually become more argumentative and convergent, with the progression of knowledge and reasoning in a dialectical manner. This was particularly noticeable in later sessions in trials of the Academic Talk tool (McAlister, 2006; McAlister, Ravenscroft, & Scanlon, 2004b). So even in peer-based scenarios without experts or expert knowledge representations, this raises questions of whether it is natural to progress towards some sort of synthesis? Indeed, the spirit of the dialogues performed through InterLoc was one of participants trying to win the argument or persuade others of their position through a process of informal logic that was realized, in the main, through the predefined linguistic signifiers. It is important to note that the quality of reasoning and critical discussion was reduced when these structures were removed in the comparative studies with synchronous Chat (McAlister *et al.*, 2004b). As a process, this dialogue game approach lies between the more logical characterization of dialectic proposed by Hegel whilst containing features of dialogic emphasized by Wegerif (2006).

Along similar lines, the dialogue games that are currently supported by InterLoc could be made more dialectical or dialogical, depending on the requirements of the educational context, by altering the dialogue moves available and the roles adopted. For example, a tutor or someone else with more expert knowledge than the students could be introduced to steer the group towards accepting a consensual position on a topic. Alternatively, more dialogic moves focusing on empathy and understanding the views of the other, such as ‘How do you feel about that . . .’, ‘Another way of looking at this might be . . .’ etc. could be introduced. Indeed, one of the strengths of the InterLoc approach is that it provides a highly flexible tool that, methodologically, can be used as a workbench to explore, test and examine dialectical and dialogic dimensions of learning dialogues and how they interplay during successful learning.

Summary and conclusions

The work reported in this article holds that it is important to understand, characterize and design technology mediated learning dialogues in terms of dialectic and dialogic dimensions. We argue that this approach makes significant steps in theorizing learning dialogue and interaction for the digital age through carefully examining these relative dimensions. These dimensions represent an anatomy of dialogue that is linked to thinking processes that can be supported by digital tools. We also hold that whether a more dialogic or dialectic approach is most appropriate depends on what we want from learning. A flexible tool like InterLoc can support learning dialogues that are either predominantly dialogic or dialectic. This raises a general point about linking thinking to problem solving, i.e. in problem solving a solution might be best sought through dialogic and dialectic means. Here a solution must be agreed and tested at some point, although a dialogic approach may well set up the conditions for a wider exploration of ideas leading to a richer dialectical synthesis. So depending on the context, learning could be ostensibly dialogic, dialectic or a blend of both. For example, we would probably prefer to discuss a concert or collaboratively create a piece of art through a dialogic process but would prefer our financial advisors and car mechanics to be more dialectic.

Another interesting and powerful factor is the degree to which predefined linguistic or other signifiers can be used or engineered to structure and constrain the interactions in favoured directions. There are some similarities between InterLoc and CACTUS. For example, the tactics Vocabulary of CACTUS has some resemblances to the sentence openers in providing the focus around which dialogue could be, and was based. The Strategies formed the evolving and coordinating themes around which understanding, and differing opinions, became linked and translated.

This article has argued that both dialogic and dialectic processes are essential for stimulating thinking and creating the spaces where learning can happen. Indeed, the relationship between these dimensions seems somewhat symbiotic in the pursuit of deep and meaningful learning. These studies show that tools like CACTUS and InterLoc do successfully mediate reasoning and cognition. However, even though these tools are designed to mediate cognition directly, such as the openers in InterLoc and the maps in the Public Order simulation, they also serve to open up and resource a dialogic space. So, for example, the students playing a dialogue game through InterLoc reported that the openers that were provided did not only shape their thinking but also made it easier and acceptable to offer probing questions, disagreements and challenges, through legitimizing constructive conflict between interlocutors. Similarly, the police officers gained from the direct lessons of the CACTUS simulation and from the discussions that it provoked and resourced. Arguably, the most important point is that irrespective of whether we make dialogue and thinking and end in itself, or link it to problem solving and contextualized action, its essential that we operationalize the dimensions highlighted in this article to design and support learning dialogues that make thinking and thinking together happen. As it not only the case that *Cogito ergo sum*, but also *Cogitamus ergo sumus* (we think therefore we are).

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