

Talk about texts at the computer: using ICT to develop children's oral and literate abilities

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Abstract

This article describes the outcomes of recent research on children's talk while engaged in joint literacy activities in primary school (Year 5). The research is based on a conception of talk as a tool for 'thinking together', with computer software being treated as a resource for organising and focusing children's involvement in collaborative activities. The results are used to discuss the value of classroom talk and computer-based activities for promoting children's literacy development.

Introduction

In our recent and continuing research in British primary schools, computer-based collaborative activities have formed an important role in our attempts to develop children's skills in talking, writing, and reasoning. The research is based on a sociocultural conception of language as a tool for collective sense-making, or 'thinking together' (Mercer, 2000) and social interaction is treated as a potentially important formative influence on the development of individual, psychological capabilities (Vygotsky, 1987). The research was also influenced by the pioneering work of classroom researchers Barnes and Todd (1977), who suggested that pupils engaged in joint tasks such as reading comprehension and problem solving should be encouraged to make their ideas explicit in ways that would not normally be required in 'everyday' discourse. In a more 'exploratory' mode of talk they would share relevant information, explain their opinions clearly and with justification, and examine each other's opinions and explanations critically but constructively. Barnes and Todd (1995) argued that the successful pursuit of educational activity through group work depended on this kind of communication, and on participants having a joint conception of what they are trying to achieve by it. One of our aims has been to investigate the educational benefits of encouraging and enabling children to engage in more explicit, reasoned dialogue.

In its initial stages, our research was also strongly influenced by findings that primary school children

often lacked a clear understanding of the purposes of group-based discussion activities and of how they might work effectively together in them. This might account for the fact that group work observed by researchers often seemed unproductive (Galton and Williamson, 1992). One possible reason for this situation seemed to be that teachers – in all educational sectors, from primary to university level – rarely made explicit to students the purposes of classroom activities or provided guidance about what would constitute a 'good discussion', perhaps assuming that these things were self-evident (Mercer, 1995; Sheeran and Barnes, 1991). Having reviewed studies of group work in primary classrooms, Galton and Williamson concluded: 'For successful collaboration to take place, pupils need to be taught how to collaborate so that they have a clear idea of what is expected of them' (*op. cit.*, 1992, p. 43).

Ground rules for Exploratory Talk

The notion of 'educational ground rules', as introduced by Edwards and Mercer (1987), also had an important formative influence on the research. This term refers to the implicit norms which govern the spoken interactions between teachers and pupils, and which generate its familiar and distinctive patterns. An initial aspect of our investigation was therefore to bring to the surface the tacit expectations or 'ground rules' about how language should be used in schools, and what children are meant to be learning to do with it. One way we did this was to ask teachers involved in our research to make explicit their views about how they would like children to talk in joint activities – to specify the kind of features which they would use to identify a 'good discussion'. From their responses – which showed a remarkable degree of consensus – and from the results of other relevant research (such as that of Barnes and Todd, 1977, 1995; Norman, 1992) we attempted to define a kind of talk which would be good for solving intellectual problems and advancing understanding. Following Barnes and Todd, we called this *Exploratory Talk*. Our most recent definition of this way of communicating is as follows:

“Exploratory talk is that in which partners engage critically but constructively with each other’s ideas. Relevant information is offered for joint consideration. Proposals may be challenged and counter-challenged, but if so reasons are given and alternatives are offered. Agreement is sought as a basis for joint progress. Knowledge is made publicly accountable and reasoning is visible in the talk.” (Mercer, 2000, p. 98.)

We also aimed to describe conditions which would be favourable for the emergence of Exploratory Talk in joint educational activities (at the computer and elsewhere). Our earlier observational research (as reported in Wegerif and Scrimshaw, 1997) suggested that the following conditions were important:

- (i) partners must *have* to talk to do the task, so their conversation is not merely an incidental accompaniment;
- (ii) activity should be designed to encourage cooperation, rather than competition, between partners. There should normally be an expectation that partners should reach joint agreement at each decision point in a task;
- (iii) partners should have a good, shared understanding of the point and purpose of the activity;
- (iv) partners should have some critical understanding of how talk can be used for sharing ideas and solving problems effectively.

One item in that list which sometimes gives rise to critical comment by researchers and teachers is the expectation that ‘partners should reach joint agreement at each decision point in a task’ (which reflects the feature of Exploratory Talk that ‘agreement is sought as the basis for joint progress’). Surely, it is suggested, productive intellectual discussions do not need to be forced to consensual conclusions? While this is certainly a reasonable point, it is our view that the requirement that agreement should be reached sets up conditions which mean that children are more likely to consider all points of view within a group before proceeding with a task, and that members of a group are more likely to develop a shared responsibility for their endeavours. When an activity involves the creation of a jointly-authored piece of writing, the requirement that all agree on what it should include is not only important, it is also likely to encourage children to make explicit the knowledge each of them has which is relevant to the task – which may include the results of what each has learned about creating a particular type of text. There is also empirical evidence that problem solving activities which encourage children to reach agreement have more significant educational benefits. Howe, Tolmie, Duchak-Tanner and Rattray (2000) have carried out a series of investigations on the value of discussion for the

development of children’s conceptual understanding in science. On the basis of their experimental comparisons of different types of computer-based hypothesis testing task (with children aged 9–11), they were able to specify the kind of activity which was found to promote most effectively the development of both conceptual and procedural knowledge. These were activities with a four-part temporal structure: (a) pupils first debate their conceptual understanding and reach a consensus about the hypothesis to be investigated (with the pursuit of consensus a key requirement); (b) they then subject their consensual positions to expert guidance (by a teacher) about how to pursue a practical controlled investigation of their hypothesis; (c) they next perform the investigation; and (d) they finally discuss the outcomes together to draw conclusions. In controlled comparisons using activities which were identical except that there was no requirement that the members of a group reached a consensus, Howe et al. found that activities without that requirement had significantly less beneficial effect on the development of children’s scientific understanding.

Implementing the ‘Thinking Together’ programme

In a series of action research projects, we have worked closely with teachers to implement and evaluate the ideas described above. We have described some features of this ‘Thinking Together’ research in more detail elsewhere (for example, Mercer, Wegerif and Dawes, 1999; Wegerif, Mercer and Dawes, 1999), but in summary the procedure has been as follows. Researchers first engage in professional development sessions with teachers, in which the notions of Exploratory Talk and ‘ground rules’ are made explicit and discussed. This way of talking is then introduced by teachers to their class, with teachers ‘modelling’ that kind of talk, and each class establishing its own ‘customised’ set of ground rules for use in its discussions (based on the teacher’s awareness of the concept of Exploratory Talk). An example is provided as Figure 1 below. The children then pursue the rest of a specially designed programme of Thinking Together lessons, over a period of no less than ten weeks. These lessons have a consistent format in which teacher-led sessions and group-based activities are integrated, and in which the content of activities is directly related to various subjects of the prescribed school curriculum. Research-

Our talk rules

1. Cooperate – try to get along with each other
2. Take turns to talk and to listen
3. Share your thoughts
4. Ask for reasons
5. Think together about everyone’s ideas
6. Try to agree about what to do

Figure 1. Ground rules for talk from one primary class

ers make observations of classroom activity throughout this process, as well as making pre- and post-involvement assessments of children's capabilities in language use and in reasoning.

Computers as a focus for joint activity

The idea that computers can provide a good focus for collaborative learning is supported by a number of studies (Howe, Tolmie and Mackenzie, 1996; Littleton and Light, 1999; Scrimshaw, 1993). However, classroom-based observational research by ourselves and colleagues revealed that much of the interaction taking place at the computer in primary classrooms was not of any obvious educational value (Fisher 1993; Mercer, 1992, 1994; Wegerif and Scrimshaw, 1997). In most cases, the children observed were not discussing their work together and showed little sign of learning from each other. For example, one child might take all the decisions while the others watched; or children adopted a competitive style and did not collaborate at all. Very little Exploratory Talk was observed.

A second issue concerns the quality of educational software and its appropriateness for stimulating collective thinking. Software design can strongly influence the quality of group discussion – and research suggests that not much software used in schools is well designed to support group work or discussion (Anderson, 1993; Fisher, 1993; Wegerif, 1996, 1997). We have responded to these issues in two ways. First, we have designed new items of software and software features specifically to encourage Exploratory Talk. Second, we have designed classroom activities around existing software in a way intended to encourage Exploratory Talk.

The IDRF sequence and features of software design that encourage discussion

In earlier research, our colleague Eunice Fisher (1992) noted that the talk of pupils working together on tutorial software commonly had the same IRF (Initiation, Response, Feedback/Follow-up) discursive structure as most teacher-pupil dialogue (Mehan, 1979; Sinclair and Coulthard, 1975). We have since proposed a further possibility, the IDRF (Initiation, Discussion, Response, Feedback) sequence, where an element of productive talk *between pupils* is inserted into what would otherwise be a directive teaching exchange (Wegerif, 1996). It is at this point that the computer provides its invaluable support for collective 'inter-thinking'. For this form of educational exchange to occur, active engagement with the software must be put on hold after the computer's 'initiation' while pupils jointly consider their next move. The interesting thing about this exchange structure, from a pedagogical point of view, is that it has the potential to combine interactive learning with directive teaching by steering

peer-group activity towards appropriate curriculum goals.

Observational research enabled us to judge for ourselves if particular items of educational software supported or inhibited productive discussion. (See Wegerif, 1997, for a fuller account of this.) We concluded from these observations that the following features of software design were beneficial:

- activities include problems which involve the rational consideration of available information, and which are sufficiently complex to benefit from being analysed through joint reflection and discussion;
- problems and choices are embedded in a motivating narrative;
- a clear purpose for the activity is made evident to participants and is kept in focus throughout;
- on-screen prompts remind participants to talk together and encourage them to make predictions, proposals and reasons explicit;
- information which can be used for reasoning about decisions is clearly presented on the screen;
- instructions do not encourage rapid decision-making, competition within the group, or serial turn-taking;
- unless the task is expressly concerned with writing development, responses should require simple keystroke responses rather than extensive typing (as this tends to damage the pace and continuity of discussion).

'Kate's Choice': an interactive moral tale

Using the above design principles, one member of our team (Rupert Wegerif) produced a program called *Kate's Choice*. This is an interactive narrative designed to elicit Exploratory Talk. Children are introduced to a girl called Kate, whose best friend Robert tells her a secret; he has stolen a box of chocolates from a shop near their school. He says that they are for his mother who is in hospital. Robert begs Kate not to 'tell'. She agrees, but subsequent events make it difficult for her to decide whether this promise should be kept.

Kate's Choice relates to both the English curriculum and the citizenship curriculum. It asks children to elaborate the perspectives and actions of characters in a fictional tale and to use their imagination to extend the narrative in new possible directions. It also foregrounds the importance of discussion and of considering other points of view in making moral decisions. The software does not simply present the story, but engages children in a structured task about it. At each stage, the children (working in groups of three) are asked to help Kate resolve her moral dilemma. One decision-making frame from *Kate's Choice* is shown as Figure 2. One of the main aims of the software is to stimulate talk about the conflict between personal

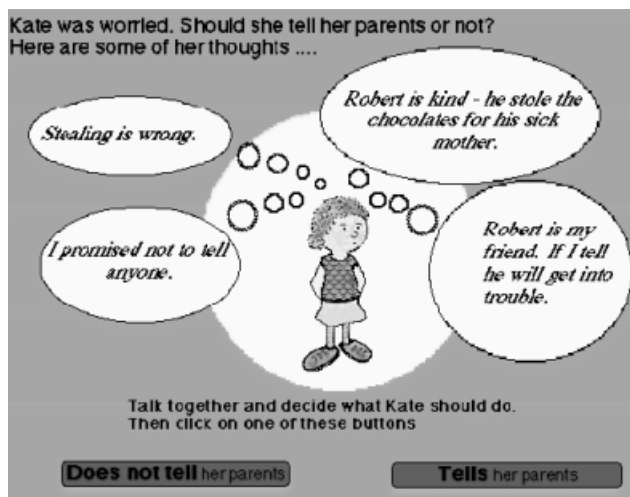


Figure 2. A decision point in *Kate's Choice*

morality (loyalty to a friend) and social morality (stealing is a crime). At each of several stages in the narrative, the children are asked to consider the relevant information at their disposal, and the points of view of each of the characters involved, before coming to a decision and proposing what should happen next. So although the content is focused on citizenship issues, success in the task involves the effective use of various kinds of language skills. Literate skills are required in reading the narrative, appreciating the perspectives of the characters involved, and projecting the narrative forward along hypothetical routes which would arise from each possible choice Kate could make; and oral skills are required in making proposals, presenting reasons, listening to the views of others and resolving different points of view. Taking a Vygotskian perspective, our hypothesis was that if children participated in the task using the appropriate 'ground rules' for talk, there would be good opportunities for them to practice these language skills and to learn new and effective ways communicating and thinking from their partners.

Procedure

Through studying different groups of children working on *Kate's Choice*, we were able to assess its value for encouraging Exploratory Talk and generating a productive joint consideration of the narrative. Our evaluation was not of the software in isolation, but rather as an element of the Thinking Together programme of activities. In making this evaluation, we were concerned with many aspects of children's learning and development which are not directly relevant here but which are discussed elsewhere (for example, Mercer, Dawes and Wegerif, 1999; Mercer, Wegerif, Dawes, Sams and Higgins, 2003). But as part of this evaluation we compared the way that children in 'target classes' (who had participated in the Thinking Together programme) compared with children in 'control classes' in similar schools (matched for

social catchment) who were given the software without any special preparation for discussion. Mixed ability and mixed gender groups of Year 5 children (age 10–11 years) in target and control classes were therefore observed and video-recorded using *Kate's Choice*. In the particular investigation from which the transcripts presented below are taken, three groups of three children (one from each of three Year 5 target classes) were video-recorded for comparison with matched groups in three control classes.

Results

Our analysis of the recorded and transcribed talk shows that the talk of the children in the target classes exhibited significantly more of the following features than did the talk of control groups:

- children asked each other task-focused questions;
- they gave reasons to justify statements and challenges;
- they considered more than one possible position before making a decision;
- opinions were elicited from all members of the group;
- members of a group reached agreement at each decision stage of the activity.

In contrast, the talk of control groups showed more of the following features:

- the child controlling the mouse made unilateral decisions;
- the choice of the most dominant child was accepted without discussion;
- arbitrary decisions were made without debating the alternatives;
- children spent very little time at each decision point before moving on.

Target groups responded to the talk prompts provided by the software as an opportunity to engage with one another's ideas through Exploratory Talk. They also tended to spend much longer at each stage of the narrative as they considered the issues in more detail and made reasoned choices. There is little doubt that the target children achieved a deeper joint understanding of the moral issues embedded in the story and of alternative directions in which the narrative could be taken. We therefore concluded that the Thinking Together programme had encouraged children's more effective use of language as a tool for comprehending a narrative text and reasoning about it – and that *Kate's Choice* provided a good framework for exercising those language skills.

The following transcripts (Transcripts 1 and 2) illustrate typical differences between the discussions of the target and control class children. They both represent children dealing with the frame of *Kate's Choice* illustrated in Figure 1, (p. 82). This was an important

decision point in the narrative activity and so was used to make systematic comparisons between the target and control conditions. Transcript 1 is the talk of a group from a control class.

Transcript 1: Do That

Jared: (Reads from screen) 'Talk together and decide what Kate should do then click on one of the buttons.'

Tony: What should we do?

Jared: Do that. (Jared points at the screen)

Tony: (Turning to call the teacher) Excuse me. (Turning back to group) We don't know what to do.

Effie: (Clicks mouse)

Jared: Yes we do.

(Total time: 42 seconds)

The children in Transcript 1 did not use the narrative activity as an opportunity to 'think together'. Effie, who happened to have the mouse, decided the choice for the group. This assumption of control went unchallenged and the group moved rapidly through the task. The moral ambiguities of Kate's situation, and the ways that the character Kate might respond, were not explored. There was no explicit reasoning, and no requests for reasons to be given. Little time was spent discussing this frame or any other part of the programme.

Transcript 2 is an extract from the discussion of a target class group (who had been involved in Thinking Together lessons for several weeks at the time of the recording). [Very obvious extended pauses are marked // and simultaneous speech is marked by square brackets at the beginning of the overlap.]

Transcript 2: What do you think?

Gary: Right we've got to talk about it. (T looks at S)

Trish: What do you think? (T points at G)

Sue: What do you think?

Gary: I think even though he is her friend then um she shouldn't tell of him because em well she should tell of him em because was, was, if he's stealing it it's not worth having a friend that steals is it?

Trish: No

Sue: Why do you think that?

Trish: We said why//I think that one as well do you? (T points to the screen and looks at S)

Gary: I think she should tell her parents, do you? (G looks at S)

Trish: I think//I'm//I think even though he is her friend because he's stealing she should still tell her parents and her parents might give her the money and she might be able to go to the shop and give them the money

Sue: I think um//

Gary: But then she's paying for the thing she stole so I think he should get the money anyway. He should have his ...

Sue: [I think that he should go and tell his mother.

Gary: [... own money

Trish: Even though she has promised

Sue: Because he's// well you shouldn't break a promise really should you?

Gary: What's it worth having a friend if he's going to steal?

Trish: If he steals If you know he's stolen if she don't tell her parents then he will be getting away with it (T looking at S)

Gary: It's not worth having a friend that steals is it?// (3 second pause)

Sue: OK then (S puts hand on mouse)

Trish: Ain't worth it is it?

Sue: Tells her parents

Sue: (clicks mouse)

Gary: Yeh go on

(Total time: 109 seconds)

In Transcript 2 – which, like Transcript 1, was quite typical of the group's discussion as a whole – the children presented their opinions in extended turns, justified their views, asked each other for their views and reasons, and challenged views with which they disagreed. The transcript illustrates how a group of children can engage in a debate about moral issues of fairness, justice, and loyalty. They took their time (there are several extended 'thinking' pauses), considering alternatives carefully before taking a shared decision. They were implementing their agreed ground rules for talk. This is not a perfect reasoned discussion; few additional reasons were given in support of the initial position taken by Gary, and it is hard to tell if Sue was persuaded by the reasoning or merely acquiesces to the strength of the majority view. The use of strategies such as asking 'What do you think?'; 'Why do you think that?' are a little formulaic. These children were in the process of learning a new way to engage with one another; their unpractised style showed through. Nevertheless, this discussion has some key features of Exploratory Talk.

It is interesting to speculate on how these two groups' discussions might inform a writing assignment based on this activity. Asked to create an ending to the narrative, or to engage in a discussion of crime in society, the members of the target group (Transcript 2) would each have some new and relevant 'common knowledge' generated by their discussion as a resource. Members of the other group, however, would not have gained such a resource from their interaction.

Further developments: Exploratory Talk On-line

In two schools involved in our most recent project, we organised additional activities to enable children in

target classes to apply their skills in thinking together when communicating electronically. Classes from two separate schools were organised as paired groups, and the Oracle conferencing software *Think.com* was used to organise an on-line forum for discussion between groups. *Think.com* provides an on-line environment for sharing ideas and contributing text, data or documents for discussion. Schools are provided with e-mail and conferencing links which comply with standards for Internet safety set by the UK government's Department for Education and Skills (DfES, 2002a). To engage in this activity, the children needed to learn to use a new kind of literacy tool: computer mediated communication (CMC). As in this case the children were both talking with their group *and* using a web-based CMC software to communicate with another group, the situation was quite complex. As Wertsch (2002) has pointed out, CMC normally generates a 'speech' genre characterised by 'a sequence of turns, each of which involves an extended, maximally explicit, fully developed, and uninterrupted utterance', in contrast with the speech genre of face-to-face communication which is characterised by 'a give and take of intense, rapid-fire, face-to-face dialogue, where utterances are often fragmentary and interrupted' (p. 108).

The groups' face-to-face and on-line discussions were related to a specific collaborative writing task: the creation of a web-site about topics in the Year 5 science curriculum. Figure 3 is an extract from the initial contact written by one group to send to their partners.

HELLO! ... We are class 5M which has fifteen children in it, eight boys and seven girls.
We are excited about sending you a message and we love reading your replies.
We are hoping that we will be able to help each other with our Science subject after the Easter holidays ...
Today in our talking lesson we have a group of three people being videoed. We don't know how they are getting on at the moment but we hope they have remembered all the talking lesson rules....

Figure 3. First contact

Figure 4 is the response from the partner group.

Hello there, we have received your message. Thank you for your short note ... In our science lessons we are talking about materials. What are you talking about in science?
We have mainly been talking about solids/ liquids/ gases.

Figure 4. The reply

The subsequent planning and creation of web pages involved the use of two further commercially produced software packages. First, children used *e-mindmaps* to construct an overview of their web pages. These concept maps were incorporated into the web template software *Site Central*. Finally the pages were shared for comment using *Think.com*.

The teacher's role

As well as studying talk amongst children, our research has also included an examination of the role of the teacher in the context of the Thinking Together programme and more specifically intervention when groups are working at the computer. For example, we wished to address these questions:

- How can a teacher use interaction with children to 'model' features of Exploratory Talk?
- How can the intervention of a teacher help 'scaffold' children's achievement and help to develop their thinking?

Lesson plans for the ICT-based work provided a structure with which to encourage children to undertake joint reasoning through 'exploratory writing'. Teachers were asked to:

- model Exploratory Talk during their introduction;
- encourage groups to remember to use the ground rules for talk;
- use the closing plenary to enable the whole class to share their experience – that is, undertake what Gibbons (2001) calls 'teacher-guided reporting':

"The teacher's role is crucial ... her interactions with individual students provide a 'scaffold' for their attempts, allowing for communication to proceed while giving the learner access to new linguistic data ... teacher-guided reporting encourages learner language to be pushed."

In this way, the children involved in these activities were guided into reviewing their understanding of the science topic, their written communications on-line, their experience of using the software, and their performance as a 'talk group'.

Transcript 3 provides an example of a teacher monitoring the work of a group of children who are engaged in a joint, computer-based writing activity (involving CMC exchanges between partner schools, as described above). Unlike the group activities of Transcripts 1 and 2, this type of situation represents an 'asymmetrical' interaction between the children as a group and the teacher as an authoritative figure. This segment of talk involves a group of Year 5 children who are revising a paragraph from an e-mail message which they are about to send to a group in their partner school. Its content is the curriculum topic 'How to have a healthy body'. The teacher has just joined the group as the transcript begins.

Transcript 3: Working well

Teacher: Right. Somebody is going to read this to me now.

- Declan: 'Dear Springdale. In Science we are looking at the healthy human body. We need a lot of exercise to keep our muscles, hearts and lungs working.'
- Samia: 'Working well.'
- Declan: 'Working well. It also keeps our bones strong.'
- Samia: Yes. We don't need a full stop.
- Teacher: Yes. That's fine. That's all right. Carry on. 'Flies...'
- Declan: 'Flies and other animals can spread diseases and germs. That is why it is very important to keep food stored in clean cupboards, et cetera.'
- Eva: Is cupboards spelled wrong? (It is written 'cubourds')
- Teacher: Yes, it is spelled wrong actually. It is cup-boards. Cup-boards.
- Samia: (reading as teacher writes) B-O-A-R-D-S.
- Teacher: It's a difficult word: C-U-P cup, and then you've got the OU makes an 'ow' sound. But it's OA, boards.
- Eva: O, A.
- Teacher: OK. Can I ask you a question? And et cetera is ETC, not ECT. I want to ask you a question before you carry on. So why have you felt it is important as a group to send Springdale this information?

(Several children speak together)

- Teacher: Just a minute. Let's have one answer at a time.
- Samia: Cause if they haven't done it yet. We can give them the information
- Teacher: [Yes
- Samia: .. [that we have found in the book and so when they do get – when they do this part they will know, they will know, so, to answer it.
- Teacher: OK. Excellent. So what were you going to say Declan?
- Declan: So they can have a healthy body and they can use it for information.
- Teacher: OK.
- Eva: And plus, if they haven't got the books.
- Teacher: And if they haven't got the books. Now before you tell me anything else you've found in a book, I think, don't know what you think, do you think it would be a good idea to tell them why you are// what you've just explained to me? We are sending you this information because...
- Samia: Just because, we couldn't find, something like//
- Declan: They could be doing it right now.
- Teacher: Well, they might be.
- Samia: We are sending you this piece of information just in case you haven't done it yet, to help you.
- Teacher: Right, discuss it how you want to say that. OK?

In this interaction, the teacher responds to the children's initial requests for help by providing the correct spelling of 'cupboards' and 'et cetera'. She then introduces a topic which is relevant, in a very different way, to the development of children's literacy. She asks the children to clarify their ideas about the purpose of sending information to the other school. During the

ensuing conversation she reminds them to take turns when giving their opinions, and encourages them to achieve an agreement before completing the message. In these ways, she is 'scaffolding' the development of the children's literacy practices. By orientating their attention to the purpose of their written communication she helps the children transcend prosaic features of the task such as correct spelling. Through intervention the teacher directs and 'models' collective thinking for the group. She stimulates a discussion so that the children express their ideas orally and then incorporate the results into their written text. The text they eventually produced is reproduced as Figure 5 below. Its content embodies their discussion with the teacher.

Dear Springdale

In science we are looking at the Healthy Human Body. We need a lot of exercise to keep our muscles, heart and lungs, working well. It also keeps our bones strong. Flies and other animals can spread diseases and germs. That is why it is very important to keep food stored in clean cupboards, etc. We are sending this information to you just incase you haven't done it yet. We got this information from a book called Children's First Book Of Human Body on page 44. If you have not got this book, you might find it in a Library close to you.
from
Declan, Samia, Eva.

Figure 5. The group's message to Springdale

Collaborative writing is a very complex process that depends on the contributions and cognitive resources that each child can bring to the process (Fernandez, 2001). In this example we see a teacher helping the children to achieve this task in a way that may help them to work independently in later sessions.

Conclusion

Our research has shown how group discussion can help children's literacy development. However, we have also shown that simply putting children together to talk is not enough; they need to be helped to understand how to use language as a tool for thinking together. The influence of this research can now be seen in educational policy in the UK, with training materials for teachers related to the National Literacy Strategy including sections on 'the management of group talk' and 'listening' as well as the more traditional topics 'writing style' and 'reading for information' (DfEE, 2001) and the Key Stage 3 Strategy including guidance for teachers on how to enable 'Thinking Together' (DfES, 2002b).

Our research has also advocated a particular perspective on the role of computers in the development of children's spoken and written language skills. From this perspective, computers are seen not only as a source of relevant information or a means for structur-

ing individual learning but a resource for joint activity. Computers motivate children and hold their attention, and the ways that the pace and sequence of events can be influenced through software design make ICT a distinctive and valuable resource for the organisation of group-based literacy activity. The choice of software is important, but software needs to be placed in a pedagogic frame. Generic types of software such as PowerPoint or Word offer a resource to support discussion if used within a talk-focused lesson. The quality and range of group discussion can be crucial for enabling individuals to produce a better quality of writing.

The teachers and children who worked on the on-line activities of the research encountered some practical problems, mainly related to the constraints of time and the ability to maintain ongoing contact with the partner class. These are common problems in computer-based educational activity. But despite these difficulties, the teachers reported that they found the approach an exciting and motivating way to help their pupils engage in literate activities. They indicated that children talked effectively in constructing ideas, using the ground rules and the support of the computer for planning, appraising, editing, and presenting work. The task appeared to be meaningful and motivating to the children, providing an authentic audience of supportive peers and purposeful opportunities to collaborate with them.

We have found that, under the right conditions, children's engagement with ICT (a) increases their use of the productive and equitable type of discussion we have called Exploratory Talk; and (b) can focus their talk on aspects of reading and writing which are important for their literate development. The research has also highlighted ways in which teacher-pupil dialogue can contribute to the development of children's understanding of the functional uses of spoken and written language. Our findings provide evidence that computers can have a distinctive role for supporting group activity and the development of children's talk and literacy. However, our research suggests that computers will only function well in this role if their use is integrated with the teaching of speaking and listening skills. Unless children are aware of how to make discussion useful for learning – to use language well as a tool for thinking together – they miss the valuable opportunities that group work offers.

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