

Rival Classroom Discourses and Inquiry Mathematics: 'the Whisperers'

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A class of nine- and ten-year-old children were working on fractions of shapes. Two worksheets were given out and the children were asked to look first at the one starting with a rectangle. This caused some confusion as one sheet started with a circle and one with a square. In response to this, the teacher asked, "Do you know what a rectangle is?". He pointed to the sheet in question and one of the children said, "But it's a square". The teacher looked again at the sheet, admitted that it was a square and apologised for calling it a rectangle. As the teacher started to explain the sheet, one of the children sighed slightly and said in a whisper, "Well, anyway, it is a rectangle".

The last remark uttered in the above was one of many unsolicited comments heard during a year of participant-observation research in a mathematics classroom with myself in the role of a classroom helper. This article will focus on these remarks and those who made them.

The class in question comprised nine- and ten-year-olds in a British primary school. They were a 'bottom set': in other words, they were all considered to be 'less able' as far as mathematics was concerned. There were four children in the class who regularly made unsolicited comments about the mathematics being considered. I call them 'the whisperers', as many of the comments were made as whispered asides without apparent expectation of a response. Sometimes the contributions were louder and represented a challenge to official classroom discussion.

The whisperers formed an unofficial culture within the classroom, with a discourse which differed from the official classroom one. Comparing the two discourses and the two cultures which they represent shows that the whisperers adopted an inquiry mathematics perspective, whilst their teacher followed a school mathematics tradition. The two cultures failed to interact successfully and the whisperers continued to be considered as relatively unsuccessful at mathematics.

This study contrasts with existing work which suggests that inquiry mathematics is something introduced by teachers and often met with resistance by children. It also highlights the difficulties of categorising children according to 'mathematical ability'.

Background

Examination of the literature confirms that the discourse style favoured by the teacher in this study follows a familiar pattern. Discourse in primary mathematics classrooms can be limited and follow predictable patterns (Brissenden, 1988). Instruction and explanation can be dominant features of classroom talk, often driven by the need to

maintain institutional norms (Bauersfeld, 1995). Also familiar in classrooms are 'question - answer - evaluation' sequences (Sinclair and Coulthard, 1975). The final part of this sequence is often used by the teacher to comment on the pupil's answer as it compares with the teacher's own 'ideal response' (Brissenden, 1988).

Pimm (1987) points out that pupils do not speak only in response to the teacher and he distinguishes between them talking for others and talking for themselves. Studies of the culture of mathematics classrooms assert that pupils generally become familiar with the unwritten rules controlling classroom discourse. Such rules are part of the customs and practices which develop in classrooms and become taken-as-shared by the participants (Voigt, 1998; Cobb and Yackel, 1998).

The idea of mathematical discourse reflecting classroom culture is further explored by Richards (1991), who identifies four domains of discourse associated with different cultures. He asserts that these cultures have different assumptions, goals and methodologies and that each is associated not only with a different linguistic domain, but with a different mathematics. The 'school math' culture identified by Richards and the associated discourse of the standard mathematics classroom matches the assumptions and dominant discourse of the particular classroom under discussion.

However, many of the unsolicited comments made by the whisperers seem more reminiscent of the 'inquiry math' culture Richards associates with mathematically literate adults. Closer analysis suggests that the whisperers also differ from the teacher in their assumptions, goals and methodologies and can therefore be seen as comprising a separate, unofficial culture within the classroom. Richards suggests that in linguistic exchanges between different cultures using different discourses there is often an exchange of words without communication taking place. It is only when consensual domains are established that the exchange of words can become *communication*.

I use Richards' distinctions to examine the culture and discourse of the whisperers, attending both to the nature of the discourse and to the shifting and complex interplay between the whisperers' marginal culture and the dominant classroom culture.

Context, cultures and domains of discourse

I gathered information about the class and the teacher by means of participant-observation in one lesson each week for an entire school year. Supporting information came from interviews and discussions with the teacher and from examining documents such as lesson plans and children's work. The teacher was very experienced and had worked in both

primary and special schools. He was used to working with bottom sets and often emphasised repetition of simple ideas in order to ensure success for all children. He demonstrated considerable patience in assisting children who had difficulty in grasping new ideas. He was also concerned about the children's performance in written assessments carried out at the end of the year and was under some pressure to make this a priority.

The teacher therefore emphasised the need to complete written tasks correctly. He was not a mathematics specialist, but felt the subject could be made 'fun'. This was sometimes done by emphasising non-mathematical contexts or diversions. He was helped by classroom assistants, a role I assumed while researching. Assistants sat at the tables with groups of children and were therefore in a good position to hear children's comments.

The classroom operated with familiar rules. Discussion was usually initiated and controlled by the teacher, while pupils spoke mostly in response to teacher questions and were expected to put their hands up and be given permission to speak. Generally such rules were observed and the classroom was relatively orderly without being totally silent. I use the term 'official talk' to refer to the open discussions which were in accordance with these unwritten classroom rules. Such talk was either initiated by the teacher or acknowledged by him, either by giving children permission to speak or by commenting on what they had said. Official talk was carried out in normal voices so that everyone could hear and the teacher expected everyone in the room to listen to the official talk.

There was a certain amount of low-level talk on occasions, sometimes caused by several pupils wanting to answer questions at once, sometimes caused by them seeking help from the other adults in the room. Although it is not possible to say how much of this talk was audible to the teacher, it seems likely that he was aware of and tolerated it, though he sometimes reminded children to put their hands up. I will refer to this talk as 'unofficial'. It was often carried out in whispers, was not aimed at everyone in the room and was usually not acknowledged by the teacher.

Listening to this unofficial talk revealed that some pupils regularly made unsolicited comments about the mathematics being considered. Throughout the course of the year, I recorded such comments, or whispers, in all but two lessons. These whisper-free lessons focused almost entirely on the completion of worksheets under test conditions. Most lessons contained several whispers, with eleven being the most I recorded in a single lesson. My notes suggest that about four whispers per lesson was the mean over the year, though this is likely to be an underestimate as I was not always near enough to the whisperers to hear everything they said. Although the comments are referred to as 'whispers', there is evidence that about a third of them were eventually heard by the teacher, sometimes as a result of repetition.

There were four children, out of twenty in the class, who regularly made such comments, though a few others made similar contributions on occasions. All four whisperers were boys, all from relatively disadvantaged backgrounds. Two, Pedro and Wesley, were African-Caribbean and two, Sean

and Darren, were white. Although discussion of gender, race and class are beyond the scope of this article, it is worth noting that when the study was carried out there was concern about the performance within British schools of boys (Arnot *et al.*, 1998) and African-Caribbean children (Commission on the Future of Multi-Ethnic Britain, 2000). There are also many studies which show that the process of organising pupils into sets by 'ability' disadvantages black and working-class children (Sukhnandan and Lee, 1998).

I consider the whisperers as a group for the purposes of this article primarily because of their regular, unsolicited comments. They also had many other features in common. However, they did not all sit together and were therefore not always in a position to hear each other's comments. Seating in the classroom, both of children and adult helpers, was determined by the teacher and frequently changed. Children felt to be working at a similar level tended to be grouped together, with adults sitting with those judged to need help.

I tended to be asked to sit with those judged to be about 'middle' of the set as far as their attainment was concerned. Sean worked on my table for most of the year, Wesley for about one term and Darren for a few weeks. On the other weeks, these boys were usually at a table near me (as was Pedro), though occasionally individuals were too far away for me to hear unless they raised their voices.

Wesley and Darren preferred to sit together and were sometimes allowed to. Sean and Wesley also sometimes sat on the same table, as did Pedro and Darren. The whisperers sometimes showed awareness of each other's comments when they were close enough to hear them. Occasionally, one of the other whisperers responded to a comment, though this was not usually the case. Comments were primarily one-off, editorialising asides, apparently made for the benefit of those making them, rather than to elicit a response from others.

A striking common feature of the whisperers is that all made only modest mathematical progress over the year, failing to realise the potential shown in their whispered comments. Although the teacher sometimes acknowledged their positive oral and mental performance, they were never among those he discussed as possible high performers in the end-of-year test, or as candidates for moving to a higher set. All four boys seemed to have some non-mathematical difficulties, including problems with reading and recording, which hampered their performance in written tasks. On the positive side, they all did reasonably well in mental arithmetic tests which required them to write answers only. Sean, in particular, achieved success in more extended oral or practical tasks which required little or no recording (Houssart, 2000a).

Another common feature of the whisperers is that their preferred approach to calculation differed from that encouraged by the teacher. This can be seen in some of the examples given in the next section. Other incidents throughout the year confirmed that the boys were reluctant to use the procedures and algorithms introduced by the teacher. They showed a preference for working mentally and for using methods which dealt with numbers holistically, rather than digit by digit. The comments of the whisperers also suggest

that they were able to link work introduced to ideas they had met before. They also showed an enthusiasm for extending ideas and saying what they noticed, even if this meant going beyond what the teacher had planned for the lesson.

Thus, the whisperers had many things in common regarding their approach to mathematics. In many respects, their approach differed from that of the teacher, with the result that they had things to say which he was unlikely to ask for. This may begin to explain why these four boys whispered and others in the class, who accepted the teacher's approach to mathematics, did not. Another factor is their attitude to the teacher and to authority. Although not seriously badly behaved in any of the lessons I observed, these boys did have a slightly 'laddish' reputation. They were certainly prepared to question the teacher's authority, albeit in a fairly mild way, and they did not totally accept the unwritten rules of classroom behaviour which may have deterred others from whispering

Like most of the children in the class, the whisperers sometimes responded to the teacher's questions to the whole class. Sometimes they did this openly as part of the official discussion, sometimes they were not called upon to answer, but did so anyway in a whisper. Their answers were usually correct. The whisperers were also similar to other children in the class in that they sometimes made comments concerning the work set. Such comments from the whisperers usually referred either to the ease of the work itself or the difficulties they had with the reading and recording involved.

In addition to the two types of comments above, which were made by many children, the remaining comments made by the whisperers were all unsolicited comments about the mathematics being considered. Closer examination suggests that these remarks fall into three main categories. The first occurred when they had noticed or discovered something. The second was when they had something to add and the third was when something had been said which they did not like or disagreed with.

Teacher: assumptions, goals, methodologies	Teacher-initiated discourse	Whisperers: assumptions, goals, methodologies	Discourse initiated by the whisperers
Work needs to be kept simple	Clear and simple explanations	Much of the mathematics considered is too easy for them	Say what they have noticed or discovered
Introduce one idea at a time	Ideas often repeated	Work introduced can be linked to ideas they have met before	Try to extend or supplement ideas
Master ideas before moving on	Harder ideas introduced only when the teacher thinks children are 'ready'	Completing written tasks can be problematic	Take issue with things they do not like or disagree with
Written work is important and needs to be completed correctly	Closed questions asked and answers evaluated	Formal procedures imposed by the teachers are rarely used	
Standard procedures for calculation need to be taught and mastered	More open questions sometimes asked, teacher knows the answers	Prefer to calculate mentally, using non-standard methods	
	Instructions given about completing written tasks		
	Standard procedures introduced and reinforced		

Figure 1 Comparison of cultures and domains of discourse

The discourse initiated by the whisperers therefore differed from that initiated by the teacher. This is a reflection of the difference between the unofficial culture of the whisperers and the dominant classroom culture, which is based on acceptance of the goals, assumptions and methodologies of the teacher. A summary of the nature of the dominant culture in the classroom and that of the whisperers appears in Figure 1, together with their associated domains of discourse. In the sections which follow, I examine more closely the discourse initiated by the whisperers, paying particular attention to what happens when their remarks are loud enough to be heard and hence to represent a threat to the presumptions of the dominant culture.

The whisperers make discoveries

Comments arose when the whisperers had noticed something, sometimes involving generalisations, such as asserting that all multiples of six are even or that all rectangles have four right angles. On other occasions, the comments were about ways of reaching answers, such as "it's two more" when forming a sequence of odd numbers. Sometimes a more complex discovery was made, such as Darren's realisation that three distinct digits could be arranged to make six different numbers.

The majority of such discoveries remained as whispers and thus the teacher had no opportunity to comment. Sometimes, however, the teacher became aware that the whisperers had noticed something. Two contrasting examples of this are given below. In the first example, Sean and Darren started by whispering their discoveries, but then repeated them and were heard by the teacher. He was impressed and invited them to share their discoveries with the class.

The children were drawing round plane shapes, then cutting out the shapes, folding them and marking on the lines of symmetry. A few children showed particular interest in how many ways a circle could be folded. Darren said the circle could be folded "... in any way". Sean said, "... it can go anywhere through the middle, any line on the circle". They were later invited to tell the rest of the class what they had discovered.

In the example above, the discoveries had been made as a result of working on the task set by the teacher. In the next example, however, the discovery arose when the child had abandoned the official task because he had noticed something interesting.

The teacher asked the children to do $101 - 79$ using a calculator and then gave the correct answer. Wesley became interested in the incorrect answer obtained by the boy behind him who sometimes had difficulty with the calculator due to poor hand control. The teacher moved on to discuss the next task, but Wesley continued to press buttons on his calculator. At one point, he appeared to copy down a number from the calculator on the back of a digit card.

The teacher started to introduce the written task which was to do a page of subtractions using a standard

written method before checking the results using a calculator. The teacher admonished Wesley for turning round and talking to the boy behind him. Wesley said, "I was telling him something about maths", but the teacher did not reply. As the books were given out later, Wesley told me what he had been whispering about. He showed me that repeatedly pressing the equals symbol changes the answer. I asked what was happening and he explained by clearing the calculator, entering 3 and repeatedly pressing equals to generate the three times table. I asked, "So can you do any table?" And he replied that you "can do the twenty-four times table".

In this example, Wesley seemed to be offering the teacher the opportunity to discuss his discovery by saying that he was "telling him something about maths". Wesley may have felt that his action was justifiable and a contribution to the lesson. However, the teacher did not seem interested in what Wesley had to say, but was more concerned about him being off-task.

These two contrasting examples are supported by similar incidents of both types. They suggest that if the whisperers drew the teacher's attention to the fact that they had noticed something, he sometimes responded positively with the result that the whisperers' discourse merged with the official classroom discourse. This usually occurred when they were working on a task set by the teacher. Sometimes, it seemed that the task was set up with the hope of them noticing something, perhaps the teacher had even decided what this might be. Noticing something not on the agenda, such as Wesley's discovery about the constant function on the calculator, provoked a different reaction. In such cases, the whisperers were ignored and did not persist.

Occasionally, comments about noticing something met with a reaction from one of the other whisperers, rather than from the teacher. One such occasion was when Darren made a comment about the digits in multiples of nine being 'turned round'. Darren was actually talking about odd and even digits, but his comment may have influenced Pedro who soon made a comment about 81 being 18 'turned round'. There was a similar incident between Sean and Wesley on another occasion, concerning fractions. On neither of these occasions did real discussion ensue, but rather, one whisper led to another.

There is other evidence that the whisperers were sometimes aware of each other's comments. Analysis of the whispers in any given lesson shows there were often similarities in the whispers which suggests that the boys may have been influenced by each other. When I was on the same table as two whisperers, I also felt that their body language and facial expressions suggested that they listened to each other.

The whisperers extend or supplement ideas

Sometimes the whisperers added something to an answer which had been given, or to what the teacher was saying. In many cases, this involved simply moving on to the next question or part of the question, but it could also involve continuing apparent patterns or predicting what would happen next. For example, in a task which involved colouring answers on a hundred square, the numbers coloured already were 6, 12, 24, 18, 36. Sean whispered that he

thought the next answer would be 30. In a place-value task, the teacher asked for the next odd number after 319. Pedro answered 321 in a normal voice, but then continued the sequence 323, 325, ... in a whisper.

Another example of a child taking an idea further than the teacher suggested is given below. In this case, Sean related the idea being introduced by the teacher to something which had been done in a previous session.

The teacher was introducing the idea of converting metres to centimetres, though a previous session had involved converting centimetres to millimetres. When the teacher said that one metre is a hundred centimetres, Sean whispered, "A hundred centimetres is a thousand millimetres". The teacher moved on to talking about a piece of string, which he said was just under a metre long. Sean said in a whisper, "nine hundred and ninety-nine millimetres perhaps".

In all the examples above, the whisperers were content to make these additions quietly. They made no attempt to break into the 'official' classroom discussion and did not seem concerned that their comments were not acknowledged. However, there were exceptions to this. Of the three categories of whisper, it was the extensions which appeared to be heard most frequently, though with limited effect.

An example of this occurred during a block of work on fractions. For some weeks, the teacher had been dealing with simple fractions via folding, cutting and colouring. He seemed to be avoiding discussion of equivalence and this was raised by the whisperers on several occasions. An example of this is given below.

The teacher was going through a sheet on fractions which the children had just completed and was giving them the answers. The sheet consisted of shapes which were partly coloured. The instruction read, 'Write the fraction that is coloured', but actually three alternatives were given for each shape and children had to put a ring round the correct answer. For one shape, the teacher gave the correct answer as $\frac{2}{4}$ (the alternatives offered on the sheet were $\frac{1}{4}$ and $\frac{3}{4}$). Pedro added, "That's a half".

Pedro made this contribution in a normal voice rather than a whisper, though it was not acknowledged by the teacher and Pedro did not persist. There were occasions when the teacher acknowledged such remarks with responses such as "We're not doing that yet" or "We're doing that next week". There was one occasion on which a whisperer persisted and was allowed to share his idea with the class. Darren wanted to go beyond checking the answers to a mental arithmetic test and to discuss how the answers were reached.

The teacher was reading out answers to the mental arithmetic test. Darren wanted to explain how he had done one of the questions (from 26 take away 11). The teacher seemed to ignore this for a while and continued to give answers. However, Darren persisted and was eventually allowed to explain how he had reached

the answer Darren said, "Take away 1, 25 are left. Take away 10 leaves 15". The teacher moved on to the next question. Darren's comment was not used or praised.

Although the whisperers' attempts to extend ideas were made in a normal voice more frequently than other comments, this was to little effect. The teacher had a range of responses which effectively neutralised their comments. One response was to ignore their comments and often they did not persist. If their ideas were acknowledged, it could be with a polite reminder that they were not doing that yet, thus potential discussion was effectively closed down by the teacher. A final possibility was to allow the child to share what they had to say, but then move on without embracing or engaging with the comment. Thus, the whisperers' attempts to extend ideas were excluded from the official discourse. The two types of discourse co-existed and impinged on each other, but had not merged.

The whisperers point to errors or things they do not like

Sometimes, comments were made about errors made by other children. This usually arose when children were asked to write or draw on the board or to give answers to completed work. Usually, the whisperers merely pointed out errors and inaccuracies under their breath, though sometimes they did this in a normal voice. In all of the instances I recorded, the whisperers were correct in their identification of errors.

On occasion, the whisperers went beyond identification of errors and exhibited a feel for what is important and correct in mathematics.

The teacher had written $\frac{1}{2}$ and $\frac{1}{4}$ on the board and was talking about which is bigger. He pointed out that although 4 is bigger than 2, $\frac{1}{4}$ isn't bigger than $\frac{1}{2}$. He speculated about why this is and a girl put her hand up and said "Size doesn't matter". Sean said in a whisper, "Size *does* matter".

The teacher was drawing the children's attention to the line in a fraction which he said is like the division symbol except for the dots. A child said, "Dots aren't that important". Sean whispered, "They is".

Comments were also made disagreeing with the teacher rather than other children. Sometimes this was about checking answers, but occasionally the whisperers took issue with him on more fundamental issues.

The teacher wrote a 5 on the board with a 9 underneath it and asked if it could be a 'take away'. The teacher was leading to the point that it must be an addition because "You can't take nine away from five". Although no one disputed this openly, Sean did say in a whisper, "You'd go below zero, it would have to be a minus".

In this incident, Sean was content to whisper and this was the case for the majority of comments involving dissent. However, there were some occasions when the whisperers were more open in their disagreement. This sometimes led to exchanges with the teacher in which both sides defended

their point of view. The first incident I give below arose when the teacher was trying to introduce non-mathematical humour. It suggests, like the dots remark above, that the whisperers were unhappy with un-mathematical comments.

In what seemed to be an attempt to reinforce the words 'numerator' and 'denominator', the teacher pointed to the parts of a fraction and suggested giving them names such as Anne. Pedro appeared not to like this and said to the teacher "It's a number". The teacher replied "Why can't it have a name?" Pedro responded, "It's got a name".

The second incident is chosen as it demonstrates differing views on calculation. This was perhaps the most important difference between the whisperers and their teacher and one which apparently caused frustration on both sides.

The teacher was discussing economical methods of calculation. He was encouraging a formal written method for halving or dividing by two, on the grounds that other methods could not be used with larger numbers. To prove his point, he said, "What would you do if it was a half of two hundred and eighty-six?". Sean seemed to want to take issue with the teacher's assertion that you cannot use subtraction as the numbers get bigger and he answered, "take away". The teacher used a challenging tone and asked "take away what?" and Sean responded "One hundred ... and ... forty ... three". Sean's ability to answer this seemed to surprise the teacher.

In these last two examples, the two types of classroom discourse are no longer separate. They have clashed rather than merged. The issue of calculation in particular was one on which neither the whisperers nor the teacher shifted throughout the year. Often they co-existed, occasionally they clashed, but they never appeared to reconsider their views.

Discussion

Why did these boys continue to make whispered comments, despite their apparently having little effect? Were they talking for others or for themselves? In most cases, they seemed unconcerned that their comments were not heard by the teacher, though it is possible that they were still talking for 'others' in the room, but not the teacher. They may have been whispering for each other.

Responses to comments from the other whisperers were infrequent, but suggest they were able to see the value of each other's comments. It is also possible that Sean, who often sat next to me, was whispering to me in my role as a helper. He may have perceived me as less likely to judge than the teacher, as well as knowing that I was unlikely to respond because the teacher was talking. Another possibility is that the whisperers were talking for themselves, trying to formulate their ideas.

Whether the boys were making comments for themselves or others, the comments provided evidence of unofficial mathematical activity in which the boys were engaging. It showed that they were taking opportunities to do some mathematics which matched their own view of the subject. Whispering may have aided their thought processes. It also

meant they were able to register their understanding and sometimes their dissent. Thus, the whispering can be seen as having a dual function, partly for the benefit of the person making the comment and partly for any potential audience. The whisperers got ideas 'off their chest' by expressing them in a whisper, with the possibility that someone with a similar view might hear.

The whisperers' discourse reflected their cultural assumptions and differed from the teacher-initiated discourse. Returning to the model proposed by Richards (1991), these observations confirm that the dominant classroom culture was reminiscent of 'school mathematics'. The whisperers had more in common with 'inquiry mathematics': for example, they asked questions, solved problems and proposed conjectures.

Even when the whisperers were heard, discussion did not necessarily result, and when it did, it could take the form of disagreement. In fact, the most common outcome when the whisperers were heard was that their comments were neutralised by the teacher (see Figure 2). These findings are in line with those of Richards, in that the different assumptions of the teacher and the whisperers meant that words could be exchanged or acknowledged without genuine communication taking place.

Type of discourse	Circumstances	Teacher response	Outcome
Making discoveries	Discovery based on official task, possibly anticipated by teacher	Teacher responds positively: discussion ensues	Communication based on agreement
Making discoveries	Discovery based on off-task activity	Teacher ignores	Whisperers neutralised: no communication
Extending ideas	Child does not persist	Teacher ignores	Whisperers neutralised: no communication
Extending ideas	Child does not persist	Teacher acknowledges: 'closes down'	Whisperers neutralised: words exchanged, but no true communication
Extending ideas	Child persists	Teacher acknowledges: allows comment moves on	Whisperers neutralised: words exchanged, but no true communication
Disagreeing	Child takes issue directly with teacher	Teacher engages: disagreement ensues	Communication based on disagreement

Figure 2 Outcome when whisperer's discourse is audible

Where these findings differ from some of the examples given by Richards is in the relative positions of the teacher and the pupils. Richards associates the inquiry culture with mathematics as it is used by mathematically literate adults. It is ironic that while the teacher adopted the discourse associated with 'school mathematics', the whisperers' discourse was close to that of the 'inquiry mathematics' culture. However, the whisperers were nine- and ten-year-olds judged to be in the bottom 25% of their year group and not expected to pass the formal tests they were due to sit the following year.

Other perspectives also encourage the view that the whisperers were acting like mathematicians rather than mathematical failures. In their oral contributions, the whisperers demonstrated features which some teachers associate with 'able mathematicians', such as trying to generalise and showing an interest in pattern (Watson, 1996; Allebone, 1998).

In fact, the spontaneous behaviour of the whisperers was similar to that many mathematics educators see as desirable but difficult to elicit. For example, the art of asking questions is highly regarded in mathematics, with emphasis placed on the type of questions likely to promote mathematical thinking (Watson and Mason, 1998; Martino and Maher, 1999).

However, it seems that in the case of this particular group of children, mathematical statements were made without questions being asked. Some of the most interesting comments by the whisperers arose when the teacher simplified matters to the point of saying things which were not, strictly speaking, mathematically correct. His claiming that you cannot subtract 9 from 5, that a square is not a rectangle and that large numbers can only be divided using a standard method all provoked the whisperers into dissent.

Despite their demonstration of mathematical understanding and occasionally mathematical knowledge in advance of that expected by the teacher, the whisperers consistently performed at a level well below that expected for their age in formal work. They were considered by the teacher to be correctly placed within this low-ability set.

One approach to this contradiction might be to suggest that there are obstacles preventing these children from showing their 'true ability'. Certainly, there is some evidence that non-mathematical difficulties hampered the completion of written tasks on which they were judged. Such difficulties included poor reading skills, slow recording skills and difficulty with organisation of work and materials (Houssart, 2000b).

Another possibility is that the idea of 'mathematical ability' is a vast oversimplification. In particular, the experiences of the whisperers suggest that it is perfectly possible to possess supposed 'higher-order' skills, such as the ability to generalise or extend ideas, without being accurate in the completion of worksheets.

A further possibility is that the differences between the cultural assumptions of the whisperers and those of their teacher contributed to their 'failure'. For example, the priority given to written tasks in terms of assessment meant that these boys were not considered to be doing well and were not seen as needing extension work. Assessment based on oral contributions might have reached the opposite conclusion. The provision of worksheets designed to help children carry out calculations in standard ways was also a hindrance, as it forced them into a method of recording which was unhelpful and did not relate to their own methods of calculation.

The failure of the two cultures to engage with each other created discontent on both sides and tended to emphasise their compartmentalisation. For the teacher, there was disappointment that children who sometimes made promising comments consistently failed to perform on formal tasks. For the whisperers, there was discontent at lack of recognition, coupled with boredom when the harder work they sought did not materialise. It seemed that, despite their potential, as long as the presumptions of 'school mathematics' prevailed, these boys were unlikely to experience success.

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