Private talk, public conversation

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Introduction

There is much emphasis on the importance of talk in mathematics education. In this article I explore what sort of talk we might be encouraging in mathematics lessons. I also want to explore how encouraging children to talk needs to be balanced against developing their listening, so that conversations can occur in which mathematical ideas are played with, batted around, developed, refined and changed. In this way mathematical understandings can emerge and these are refined and developed through the talk. The 'active' listening that children (and teachers) need to engage in for such conversations to occur requires effort. I am arguing for a type of talk that is different from much talk in mathematics which is more about reporting on mathematics that is already complete and so the talk resembles a series of monologues, with one child offering an idea followed by another, and the type of listening required is passive.

To promote this conversational approach to mathematics talk, I suggest that there need to be two aspects to talk in mathematics classrooms:

- Private talk in pairs or small groups – this provides the opportunity for children to 'buy in' to the mathematics being discussed, share their thinking in a secure setting and rehearse ideas that they might share more widely;
- Public conversation where the whole class is sharing and building on ideas – this is necessarily more risky than the private talk and the private talk is a necessary precursor to the public conversation being an effective event.

Private talk

In a class I recently visited the teacher put a calculation on the board and asked the children to explain to a partner how they had found the answer. Sitting down next to two boys, I listened as the first one explained his method. When he finished I asked his partner what he thought.

B: I agree
MA: Agree with what?
B: With what he said
MA: What did he say?
B: How he worked it out
MA: How did he work it out?
B: The way he said he did.

It was clear that had I pursued it this conversation it would continue to go round in circles. The boy had given all the signs of listening – facing his partner, eye contact, nodding – but clearly had not really attended to what his partner was

saying. I suspect that he was doing what many of us do when waiting for a turn to speak: mentally rehearsing what he was going to say when he got the airspace.

This may be no bad thing – each pupil had a chance to articulate his or her thinking and so consolidate it. But it could go much further. For example, unless pupils are attending to and thinking about each other's methods then it will not be possible to have a deep conversation about the relative benefits of different methods and, say, which are more effective.

Attending to each other's ideas becomes more important when using paired work to develop understanding or problem solving – if each speaker is simply talking 'to the air' then the conversation is not likely to spiral up and help each participant develop their understanding.

Listening, really listening, to a partner is not something we can take for granted. It needs to be worked on and constantly reinforced – it is not a 'one-off' emphasis at the beginning of the year but needs attending to and developing throughout the year (indeed throughout schooling).

Part of this involves helping children to see the importance of listening to each other. Research by Jenny Young Loveridge found that while children thought it was important to explain their methods to each other, the same children thought that it wasn't important to listen to other children's methods. Are classrooms full of children that think their methods are important, but no-one else's are?

Some ideas that can help children listen more actively in paired work include:

- Paired calculations;
- Solver-recorder
- Clue problem

Paired calculations

When children are working on the same calculation, and have each arrived at the answer, then they may be eager to share their method but, since they each have an answer and a method, the benefits of listening to someone-else's strategy are not immediately clear. Putting up two different but similar calculations and asking the children in pairs to each do one of the calculations and explain their solution can promote more authentic and active listening as their partner does not have a vested interest in the same calculation.

Solver-recorder

Provide one piece of paper and pen between two. Children take it in turns to be the solver – they have to do the figuring out – while their partner has to do the recording. The solver has to explain what to write down and their partner has to record what they are asked to record – they cannot take over the solving of the problem even if their partner gets stuck. (Children I've worked with like to call this solver-robot. The robot can only record.) What I've found actually happens is that the child acting as recorder, once their partner has finished, spontaneously starts to record what they would have done, but having acted as recorder they

are more likely to relate their solution method to what their partner did, either building on this or providing an alternative.

Clue problem
Take a classic 'word problem' (National Tests are a good source of these) and split the information in the problem into two parts. Put these on two separate pieces of paper together with the question. Working in pairs, they get one 'clue' each and jointly solve the problem. They can read out what is on their 'clue' card but must not show it to their partner. The reading out encourages listening and the 'not showing' rule stops one child simply handing everything over to their partner to do the work.

Public conversation

Effective private, paired, talk is only part of the story, bringing the paired work together in a whole class conversation – a maths congress as Cathy Fosnot calls it – provides the opportunity to build on the methods that children have shared privately, refine the mathematics and reach a greater collective understanding.

Many whole class public conversations I've heard go along the lines of how many different methods can we get, to the point where children seem to start to invent obscure methods simply for the sake of it. In one class children were explaining how they calculated the price of two chocolate bars costing 24p each. After the expected methods of adding 20 + 20 and 4 + 4 and doubling 25 and taking off 2, one child claimed that they had halved 96 and was praised for suggesting another interesting method.

I suggest that rather than examine a range of solutions, we need to work with children to understand and closely examine one solution. This provides the 'bedrock' for the conversations with other solutions subsequently building or being contrasted to this particular solution.

I find the following rubric helpful in managing the whole class, public, conversation and focusing the children on particular methods:

- Rehearse
- Revoice
- Repeat
- Rephrase
- Build on
- Comment on

Rehearse
When it comes to whole class conversations, I don't ask for volunteers (I don't want the same children to always be explaining, but more importantly, I have no idea whether what is volunteered is going to be a good foundation for the ensuing conversation.) While the children are working in pairs I go round listening in and choosing those children who I want to share their methods with the rest of the class – a maximum of two or three pairs. That way I can choose the

solutions and methods that are going to be most productive. I also tell these children that they are going to be sharing their solutions and methods with the rest of the class, so that they have the opportunity to rehearse what they are going to say.

Revoice

Once the children have been invited to the front of the class, saying out loud what they said in their pairs is not that easy. Even with the opportunity to rehearse what they are going to say this is likely to have gaps – it is a challenge to go from explaining something you know to putting yourself in the position of explaining it so that someone who did not use that method can understand it.

The teacher's role is important here. Two things I do. Firstly, move to the back of the class, so this does not turn into a private conversation at the board. Standing up at the front of the class is daunting for many children – by positioning myself at the back of the class the children have to talk 'over; the class to me, and I can say, 'I can't hear you back here, you need to speak up'

Secondly listening to the quality of the explanation and interjecting at points where I think clarity is needed. This is hard work because we all 'fill in the gaps' in conversations. Having listened to the private conversation and chosen these particular children to explain, I'll already have a strong sense of their method and it is easy to listen through that framework of understanding. What I have to do is listen as though I were hearing it for the first time, and to intervene in ways that will help the children to clarify their explanation, but without taking the explanation away from them. It is very easy, through the desire to move things along, to say things like 'what I think you are trying to say is … ' and take over giving the explanation. I prefer to say things like:

Hang on, you said you did … and then (something else). I don't follow this – how did you get from that first thing to the next?

I'm a bit confused. Is anyone else? Can you explain that bit again please?

Repeat

Once children have explained their method to the class, it's helpful to get others to simply repeat what has been said. I say 'simply', but children find this surprisingly hard. I am quite insistent that I want an accurate repetition of what they have heard, not an approximation. And I put it back onto the children who gave the original explanation to decide if there was an accurate repetition – 'Is that what you said? No? Ok, then tell us again, and Sandy, listen really carefully.' It may appear pedantic but I'll stick with a child, not letting them off this listening hook, until we are all agreed that an accurate repetition is arrived at. As this can be a bit threatening, I do initially here ask for volunteers but over time I will choose children to come and repeat.

There are at least three reasons for this pedantry. Firstly I want to emphasis that careful listening is what I value and that this is not easy but can be done. And secondly, there is something powerful about voicing someone-else's words. I

don't know how, but repeating something even if it is not fully understood sows some seeds of understanding. Thirdly, it provides the opportunity for everyone to listen to the same explanation a few times over – even with the best listening in the world it is unlikely that they will all have 'got it' first time round.

Revoice/rephrase
This now involves inviting children to explain what they have heard in their own words. This encourages some ownership by others of the method and begins to open up the conversation. As before, the onus is thrown back on the children giving the original explanation to decide if this is an accurate rephrasing.

At each stage I invite questions – the aim is to reach an agreed understanding of the solution being offered. Note that this is being accepted as it is – before judging the solution either in terms of it being correct or not, or in terms of the effectiveness or efficiency of the solution, the point is to try and get everyone to some level of understanding.

Build on
One purpose of the repeating and revoicing is that having reached a general understanding there then might be some discussion of the method. Building on the solution comes about through questions like:

> *Does anyone what to add anything to that method?*
> *Did anyone do anything similar to that?*

Comment on
This phase opens out the dialogue and invites more discussion about the mathematics of the solution. A distinction of intent needs to be made here between discussing the mathematics and evaluating/judging those particular children. Again, the time spent talking about the one method and reaching some general communal understanding of it is to encourage shared ownership – the idea is now the class's idea to work on and talk about, not simply that of two particular children. This is a key step in creating a mathematics-focused community rather than a teacher-focused or child-focused.

Conclusion

Talk then is central to my mathematics lessons. It is not simply that children are talking *about* mathematics, but that they are *talking mathematics*. There is a truth to the adage that mathematics is a language and just as there is a difference between talking about Italian and talking Italian, so the vocabulary to talk mathematics becomes part of the classroom discourse – it's not a list of words that you select from to talk about and describe something else, it's becoming immersed in the mathematics talk. The skill of the teaching talking mathematics is giving children something mathematically worthwhile to talk about, accepting what children say, and then supporting them in crafting the talk. This sounds difficult but is actually something parents instinctively do when talking with young children – they accept the talk that the child produces but the level of response from the adult is a little more sophisticated. They don't overtly correct

the child – this is not about saying' *no, you don't say bickkie please, say, can I have a biscuit please*' but providing a model for the more accurate communication. But note that the adult modelling comes after the child's attempt; it builds on what the child can already say. Parents, as far as I am aware, don't go round saying, '*right, today I'm going to teach you how to ask for a biscuit. You say … now try asking for some milk'*. They pick up on what the child says and build on it.

In case this sounds like a laissez faire discovery approach – just wait until the child says something about taking away and then pick up on that and talk about subtraction – it is planned, it is structured. The planning and the structuring come through the careful choice of problems and activities that the children initially work on and which, horrid term though it is, are *mathematically realisable* – that out of the informal, untutored solutions that children arrive at in solving problems there is a high likelihood of a kernel of mathematics that collectively can be picked up, examined, and crafted into formal mathematics. The interplay of dance between teacher intention and learner contribution is a complex weaving in and out, but each plays a role.

Further reading

Alexander, R.J. (2008) Towards Dialogic Teaching: rethinking classroom talk (4th edition), Dialogos,

> A brief and readable introduction to the theory and evidence for the centrality of talk in learning.

Dillon, J.T. (1994). *Using Discussion in Classrooms*. Buckingham, England: Open University Press.

> If you can get hold of it a valuable guide to managing large group discussions.

Fosnot, C. T., & Dolk, M. (2001). Young Mathematicians at Work: Constructing Multiplication and Division. Portsmouth, NH: Heinemann.
Fosnot, C. T., & Dolk, M. (2001). Young Mathematicians at Work: Constructing Number Sense, Addition and Subtraction. Portsmouth, NH: Heinemann.
Fosnot, C. T., & Dolk, M. (2002). Young Mathematicians at Work: Constructing Fractions, Decimals and Percents. Portsmouth, NH: Heinemann.

> Each of these books contains detailed case studies of children working in ways similar to those I've described above.

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