Northumbria
University
NEWCASTLE

Improving the quality of children's discussions about learning

Long gone are the days when we might, as educators, expect - or desire - children to be silent in class. This chapter argues in favour of making space for pupil talk in order to enhance learning. The context for this chapter is the Maths classroom, however there is relevance for any educator – in any subject - seeking to encourage pupils to engage more deeply, and take a more critical approach to learning.

Why do we want children to talk?

There is a growing body of research emphasising the role of pupil talk in learning (Leat and Higgins, 2002; Nichols, 2006; McGrane and Lofthouse, 2010) with some evidence suggesting that 'by verbalizing their reasoning [pupils] accept reasoning at a higher level than they start out with' (Hu et al, 2010, p. 5). In other words, by explaining their thinking – even obvious mistakes – pupils begin to identify errors or inconsistencies in their own reasoning, thereby developing understanding. Indeed, by cutting short discussions and simply giving children correct answers we may actually inhibit learning as 'the right answer often puts a stop to the child's thinking' (Fisher, 1995, p. 173). Instead, allowing children to discuss their thinking makes it more 'visible' (McGregor & Gunter, 2006, p. 29), allowing us, as educators, to identify gaps and misconceptions, as well as next steps for teaching and learning. In this way, talk has the potential to generate 'a feedback loop, which has the potential to raise attainment' (McGrane & Lofthouse, 2010, p. 94).

Providing more frequent opportunities for pupil talk can also impact positively on peers. Wright and Taverner (2008) propose that through listening to others' explanations of their thinking, pupils 'become aware of alternative ways of doing things and ways of learning' (p. 112). This process of listening and engaging with explanations provided by their peers can also support pupils in recognising gaps in their current understanding of concepts, ultimately strengthening and clarifying learning. This is logical: spending a greater proportion of lesson time in comparing and contrasting different strategies will, naturally, develop pupils' awareness of the range of alternatives available. It is reasonable to hope, therefore, some of these may make more sense to them than others, and sit more naturally within their framework of existing ideas and understanding. Similarly, it is perhaps easy to recognise that

- in some situations at least - some children may understand the explanations of their peers more readily than those of a more experienced adult. The vast majority of children within a class are at a similar point in their learning journey and so, in my experience, will perhaps have a more immediate understanding of misconceptions and how to convey ideas in a common language which may be more easily understood.

What is the role of the educator?

The role of the educator in promoting opportunities for pupil talk, and – particularly at the outset – for modelling the kind of talk most useful for learning, is absolutely vital. One key consideration must be the type of tasks which best promote discussions and explanations. This can be achieved by reducing the use of problems with fixed right or wrong answers in favour of tasks which are open-ended, with multiple possible solutions. These increase opportunities for children to discuss the strategies used, solutions reached, and the concepts explored. The phrasing of these tasks is key: for example, asking which, of a set of calculations, is the odd one out dramatically increases the number of possible answers which could be returned by the pupil. Similarly, children could be asked to find a pair of numbers, from within a given set, which total 50, or to use the digits 3, 4, 5 and 6 to find the largest product.

Such questions encourage pupils not only to develop accuracy in using a set method for calculation, but also require pupils to analyse, identify and explore patterns and relationships, evaluating mathematical concepts at a deeper, more fundamental level. In addition, tasks of this nature encourage pupils to develop skills of perseverance and resilience - because it is necessary to try various combinations of numbers to check for the most suitable solution – as well as opening opportunities to discuss strategies for narrowing the possibilities – for example through rounding and estimation using mental methods prior to identifying a pair of numbers to explore in greater depth.

To maximize the impact of these discussions, it is essential to allow time for critique of the methods used to tackle a given problem. This is known as ‘the debrief’ (Nichols, 2006), and is an opportunity for groups to present different strategies for approaching their learning, asking and answering each other’s questions, as well as comparing methods to identify strengths and areas for development. Key questions could include: ‘How do you know you've

found the answer?', What did you start with? Why?', 'How did you organise your recording?', 'What was your best strategy?', and 'How can you prove your answer?' These questions also serve to model those that pupils could incorporate into their own discussions during collaborative work. It is also useful to introduce two very simple phrases which clearly establish expectations around explanations of reasoning: 'I think … because' and 'I know … because'. Displaying these phrases prominently serves as a constant prompt to the pupils - and indeed to us as educators - of the importance of considering learning more deeply.

If children are to really discuss and debate in detail, they will necessarily spend longer on any given task. Therefore, it is important to limit the number of tasks pupils are expected to undertake in any given lesson, and – as a result – to plan each task with care, ensuring that these challenge thinking and engage pupils in high-quality discussion. In Japan, for example, where critique of methods plays a significant role in the teaching of Maths, it is common for a class to spend 15 minutes, or longer, to explore a single problem (Westwood, 2011, p. 8), thus it would be reasonable for pupils to consider just 2 or 3 problems within a lesson as a whole.

How can we facilitate pupil talk?

For talk to become truly embedded, it must become part of accepted classroom routines and culture. Many pupils may believe that appropriate procedures for talk within lessons involve putting up their hands 'and waiting to be called upon' (Jansen, 2008, p. 87). Consequently, they may associate talk during lessons with a lack of focus, viewing it as a negative behaviour, something to avoid or to undertake surreptitiously to escape reprimands or sanctions.

It is therefore important to outline expectations, as well as to educate pupils about the benefits of talk for learning. Discussing this explicitly can help to support understanding of the role of talk, not only to pupils' own learning and progress, but also to that of their peers. One possible approach could include writing class slogans (for example, '2 brains are better than 1, 3 brains are better than 2!') and displaying these as a constant reminder for pupils. Once routines and expectations have been established, regular reminders, as well as positive reinforcement using school reward systems can be used to encourage pupils to engage in

discussions about learning. For example, merits or house points could be awarded for particularly effective group talk, taking care to explain to the rest of the class the type of talk which had been used as well as why this was useful.

Opportunities for talk can be planned in various forms. These include informal 'talk partners', chosen by the pupils themselves on a lesson-by-lesson basis, as well as more formalised collaborative groups chosen by educators working with the class. Formalising networks for collaboration – particularly in the initial stages of establishing routines for pupil talk – can be important because of the strong message this conveys about the ways in which pupils are now being expected and encouraged to work. This may serve to dispel any possible misunderstandings that pupils may have about 'copying' or the need to complete individual work, which they often perceived should be carried out within a quiet, if not silent, classroom environment.

Involving an adult in the organisation of collaborative groups may also increase the potential usefulness of the groups themselves. There is some evidence that groups of pupils working at different attainment levels – for example mixed-ability trios - can provide a 'support network' (Ke & Grabowski, 2007, p. 250), as well as the opportunity to work with 'peers who would stimulate their thinking' (Boaler, 2009, p. 33) for lower-attaining pupils. Adult oversight also facilitates consideration of other key factors such as friendships, social, emotional and behavioural needs, increasing the likelihood that groups will work effectively as a team. Changing groups frequently, for example at least once each half term, may also be beneficial in allowing pupils opportunities to work with peers with a range of styles of thinking and learning.

Simply arranging pupils in groups, however, may not be enough to encourage them to collaborate effectively. Pupils' habits of producing their own, individual pieces of work may be ingrained and, even when asked to work collaboratively, they may – particularly at first – engage only in rather superficial discussions around the specific part of the task that they are undertaking, whilst continuing to work largely individually. There is some evidence that expectations around requiring pupils to write down everything that they are doing as evidence of their learning can be constraining, ultimately limiting thinking (McGregor & Gunter, 2006). To counter this, it may be useful to give groups a single piece of paper and a single

pen. This simple strategy compels pupils to work together collaboratively, sharing their ideas much more freely and discussing strategies and methods as they work.

It is also important to consider how we, as educators, can support pupils to overcome any initial reluctance to participate. For some pupils, participating in conceptual discussions may be an unsettling experience – or even perceived as a 'personal attack' (Jansen, 2008, p. 8) - which threatens to affect how they view themselves as learners (self-concept) and, therefore, their perceptions of the subject and willingness to engage in learning. Some studies have demonstrated that emphasising the role of engaging in discussions in developing understanding increases the likelihood that pupils will talk critically about their learning (Jansen, 2008). Pupils should also be taught about the value of challenging one another's thinking and its role in developing mathematical understanding, particularly as, without this intervention, pupils 'may instead think that challenging the thinking of others is unkind' (Jansen, 2008, pp. 44 – 45). Indeed, Jansen found that the notion of helping their peers may in fact provide additional motivation, as some of the pupils considered in her study 'who believed participating was threatening said they would participate if they could help their classmates or if they would meet expectations for appropriate behavior' (2008, p. 37).

One strategy which may increase the success of pupils' collaboration, is to devote time to discussion of the nature of group work. This could include discussion of rules for successful working, creating shared lists for display in the classroom. It may also be beneficial for pupils to consider the 'fairness' of unequal participation in tasks, and agree upon questions that could be used to encourage group members to share their views and participate more actively. Similarly, discussion around strategies which could be used when groups are 'stuck' can support groups to overcome obstacles in learning with greater independence, avoiding pupils becoming too reliant upon adult intervention. Whilst some of the suggestions offered by pupils may be firmly rooted in the context of Maths lessons, such as try "Trial and error" or "Use a visual representation", others may be indicative of more general reflections such as "Ignore any distractions" or "Try again!".

One technique for effective group work assigns pupils different roles such as 'leader', 'questioner', 'scribe', or 'summariser'. To help scaffold interactions, lower-attaining pupils – or those who may be reluctant to participate - could initially act as the group's 'scribe', requiring them to pay close attention to any discussions. This also ensures that these pupils

complete any necessary calculations, with the support and guidance of other group members, providing them with additional opportunities to practise the mechanics of Maths whilst simultaneously using these in context or problem-solving activities. As time goes on, and pupils become more familiar with working collaboratively, it is likely that pupils will interact more freely, without requiring the allocation of specific roles within the group.

How do we teach questioning?

Evidence suggests that open-ended questioning is most effective in providing opportunities to develop thinking and reasoning (McGregor & Gunter, 2006). Questions such as 'What will happen' encourage pupils to hypothesize and make predictions, creating 'open-ended possibilities, with no fettering or constraints on the anticipated response. Frequent use of this type of question engenders a more reasoned 'open' culture of offering proposals with justifications' (McGregor & Gunter, 2006, p. 32), suggesting the importance of carefully considering the wording of questions and interactions between educator and pupils to successfully encourage pupils to work in this more open manner.

It is not solely the questions asked by educators themselves which should be considered important. King (1994) suggests that when pupils 'use questions that guide them to connect ideas within a lesson together or connect the lesson to their prior knowledge, they engage in complex knowledge construction which, in turn, enhances learning' (p. 361). Nevertheless, although the importance of asking the right questions appears clear, how can this be achieved? The modelling of questions can be fundamental to developing pupils' questioning skills (Biddulph et al, 1986; King, 1994; Chin, 2004). This could include verbal modelling, with the teacher modelling effective examples, as well as displaying key questions and providing question stem prompts during collaborative group work (King, 1994). An example of one such prompt, using question stems based upon Bloom's Revised Taxonomy (Krathwohl, 2002), can be found below:

Which levels of thinking are you using?

Remembering	What happened after ...?
	Which is the best one?
	How did ... happen?
	What does it mean?
Understanding	What is the main idea of ...?
	How would you explain ... in your own words?
	Which facts or ideas show ...?
	How many examples can you find to ...?
Analyzing	What do you think about ...?
	What is the relationship between ...?
	What evidence can you find to ...?
	What conclusions can you draw ...?
Applying	Which approach would you use to ...?
	What would happen if ...?
	Can you explain why ...?
	How is ... related to ...?
Evaluating	What are the alternatives to ...?
	What do you think about ...?
	Is there a better solution to ...?
	What is the most important aspect of ...?
Creating	How would you test ...?
	Can you improve ...?
	Can you formulate a theory to explain that ...?
	Which changes would you make to solve ...?

Sharing - and rewarding - particularly interesting questions through initiatives such as 'Questions of the Week' may also increase pupils' willingness to engage in the questioning process until the habit of answering questions becomes spontaneous and instinctive (Chin, 2004). By emphasising the importance and desirability of asking and answering their own questions, educators greatly increase the likelihood that pupils will do so, thereby generating a positive feedback loop by which pupils' beliefs in the importance of questioning leads to increased numbers of questions asked. This in turn would lead to greater learning, underscoring pupils' beliefs in the importance of questioning. Here, again, the role of the educator in establishing a climate in which questions are welcomed is crucial. Evidence suggests that a receptive classroom atmosphere is fundamental to developing pupils' questioning (Biddulph *et al*, 1986), and that pupils must feel able to ask questions 'without fear of censure, criticism or ridicule. No matter how silly their questions may appear to be, the teacher should restrain judgmental cues and the questions must be greeted with enthusiasm, a commitment of time and in an unthreatening manner' (Chin, 2004, p. 110).

So, what are the implications for practice?

There is substantial evidence that increasing opportunities for pupil talk can lead to increased engagement in learning, as well as strengthening progress and attainment. For educators interested in developing pupil talk in their learning contexts, some key considerations are paramount. These are: developing tasks which promote discussion; establishing routines and expectations around collaborative work; and modelling and teaching pupils about the kinds of questions which foster productive talk about learning. Above all, however, educators must demonstrate to pupils the value of talk in order to create a climate and culture in which pupils feel free – and safe – to express their thinking.

References

Biddulph, F., Symington, D., and Osborne, R. (1986) 'The Place of Children's Questions in Primary Science Education', *Research in Science & Technological Education*, 4 (1), pp. 77 – 88.

Boaler, J. (2009) *The elephant in the classroom: Helping Children Learn and Love Maths*. London: Souvenir Press.

Chin, C. (2004) 'Students' questions: Fostering a culture of inquisitiveness in science Classrooms', *School Science Review*, 86 (314), pp. 107 – 112.

Fisher, R. (1995) *Teaching Children to Think*, Nelson Thornes Ltd: Cheltenham.

Hu, W., Adey, P., Jia, X., Liu, J., Zhang, L., Li, J., and Dong, X. (2010) 'Effects of a 'Learn to Think' intervention programme on primary school students', *British Journal of Educational Psychology*: pp. 1 – 27.

Jansen, A. (2008) 'An Investigation of Relationships between Seventh-Grade Students' Beliefs and their Participation during Mathematics Discussions in Two Classrooms', *Mathematical Thinking and Learning*, 10: pp. 68 – 100.

Ke, F., and Grabowski, B. (2007) 'Gameplaying for maths learning: cooperative or not?', *British Journal of Educational Technology*, 38 (2), pp. 249 – 259.

King, A. (1994) 'Guiding Knowledge Construction in the Classroom: Effects of Teaching Children How to Question and How to Explain', *American Educational Research Journal*, 31 (2), pp. 338 – 368.

Krathwohl, D. R. (2002) 'A Revision of Bloom's Taxonomy: An Overview', *Theory Into Practice*, 41 (4), pp. 212 – 218.

Leat, D. and Higgins, S. (2002) 'The role of powerful pedagogical strategies in curriculum development', *Curriculum Journal*, 13 (1), pp. 71 – 85.

McGrane, J. and Lofthouse, R. (2010) *Developing Outstanding Teaching and Learning: Creating a Culture of Professional Development to Improve*. Milton Keynes: Optimus Education.

McGregor, D., and Gunter, B. (2006) 'Invigorating pedagogic change. Suggestions from findings of the development of secondary science teachers' practice and cognisance of the learning process', *European Journal of Teacher Education*, 29 (1), pp. 23-48.

Nichols, A. (2006) 'Thinking skills and the role of debriefing', in Balderstone. D. (ed.), *Secondary Geography Handbook*. Sheffield: Geographical Association.

Westwood, P. (2011) 'The problem with problems: Potential difficulties in implementing problem-based learning as the core method in primary school mathematics', *Australian Journal of Learning Difficulties*, 16 (1), pp. 5 – 18.

Wright, D., and Taverner, S. (2008) *Thinking Through Mathematics*. London: Chris Kington Publishing.