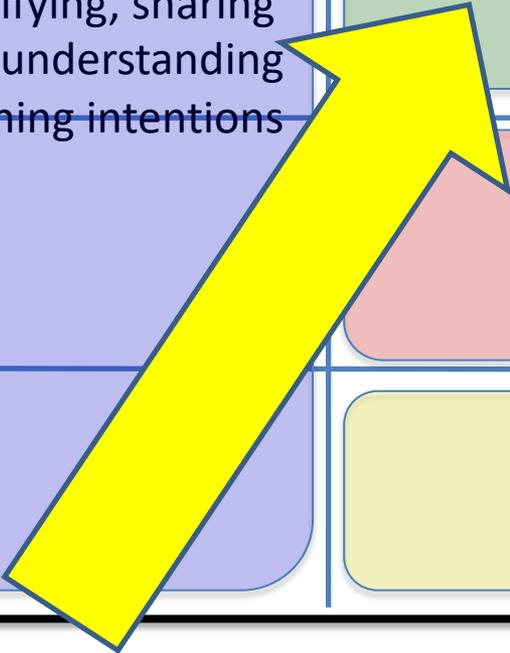




**Classroom Discussions:
Using maths talk to help students learn**

Unpacking formative assessment

	Where the learner is going	Where the learner is	How to get there
Teacher	Clarifying, sharing and understanding learning intentions	Engineering effective discussions, tasks, and activities that elicit evidence of learning	Providing feedback that moves learners forward
Peer		Activating students as learning resources for one another	
Learner		Activating students as owners of their own learning	



And one big idea

	Where the learner is going	Where the learner is	How to get there
Teacher	<p>Using evidence of achievement to adapt what happens in classrooms to meet learner needs</p>		
Peer			
Learner			

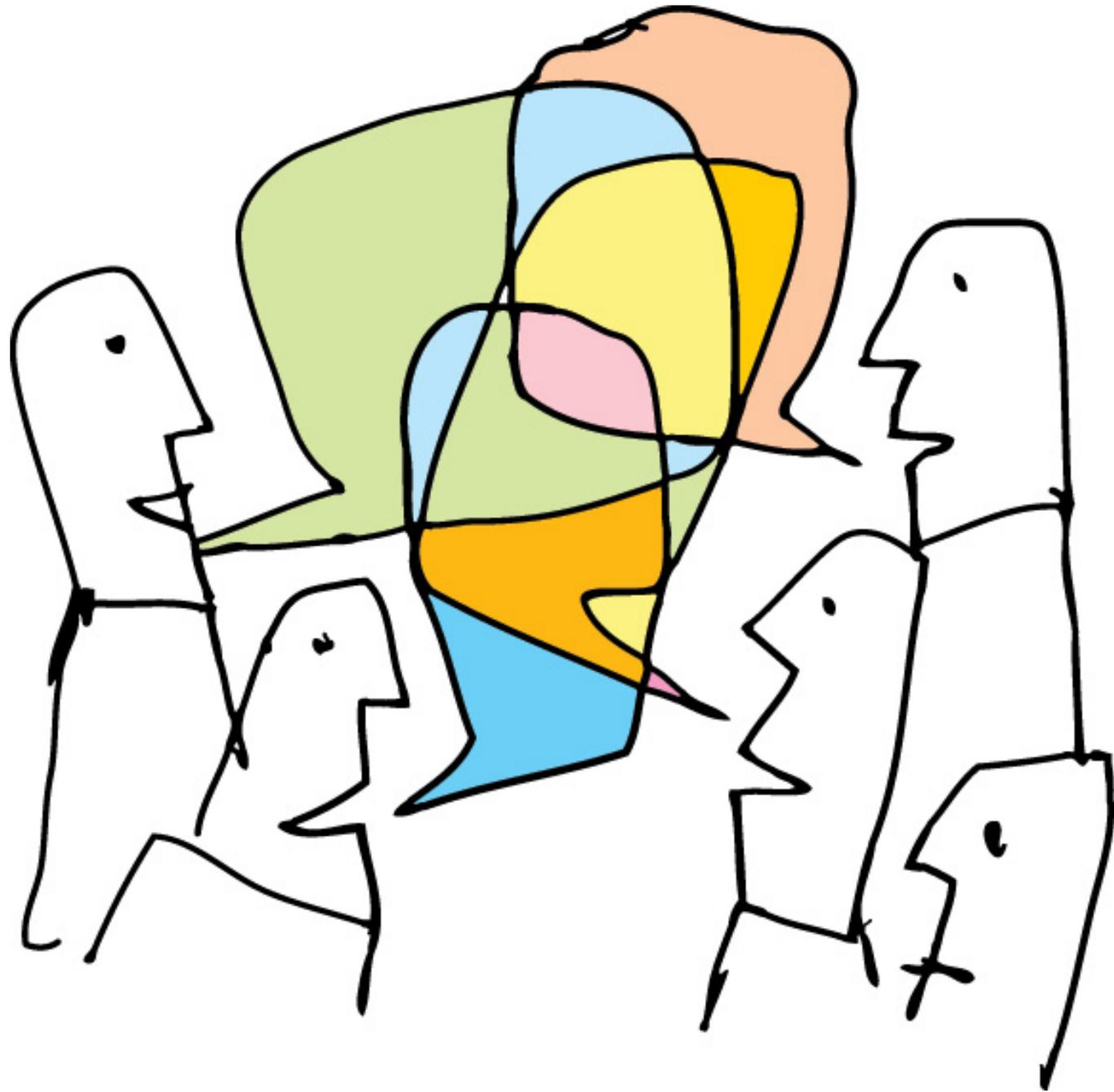
Talk can reveal understanding and misunderstanding.

This helps teachers adjust their teaching. Some people call this *formative assessment*.

And students may themselves realize what they don't understand and what they do understand.

As teachers, we have many different academic goals, and many things we want to achieve in our classrooms.

We need as large, diverse and powerful a set of instructional tools as we can find.



Talk supports robust learning by boosting memory in several ways.

Talk is a rich source of information, and plays a part in almost every memory we form.

By hearing about (and talking about) concepts, procedures, and uses, our memories have more to work with.



Talk supports language development.

When talk is used intensively in classes, students may get a richer sense of what words and phrases mean, and when to use them.

Their control of complex grammar also improves, in speaking and in reading.



Talk supports deeper reasoning

Learning to reason well takes time.

It takes practice, and it takes working with other people: explaining your own reasoning and talking about other people's reasoning.

In the classroom, teachers can give students that practice by using talk in strategic ways.



Developing Classroom Discourse

What are the talk norms in your classroom?

If someone came into your classroom, what would they hear?

Whose voices would dominate?

If we think of a dialogue as a ball being passed back and forth, who would hold the ball most of the time?

How to get students **talking!**

Why use talk to support maths learning?

What are the barriers to discussions in maths classes?

What are the steps required for productive classroom discussions?

What mathematics should we talk about?

What does productive talk look like and sound like?

Think of a child...

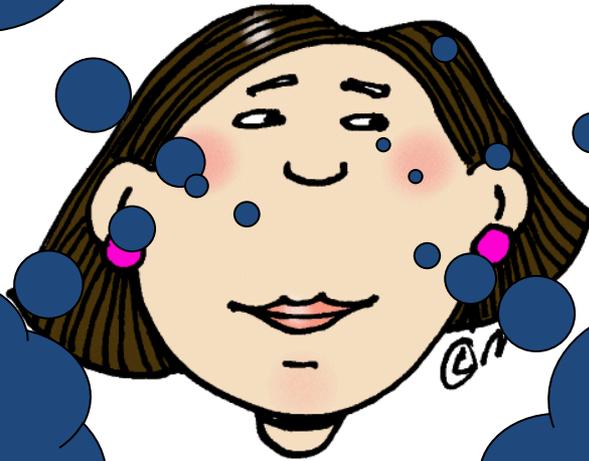
Reticent to speak
in front of an
audience

Quiet in class

Lack self
confidence

Doesn't offer
an answer
readily

Lets others 'take
over' in group
situations



Findings on classroom talk:

- Open questions made up 10% of the questioning exchanges
- 15% of the sample did not ask any open questions
- Probing by the teacher to encourage sustained and extended dialogue occurred in 11% of classes
- 43% of teachers did not use any such moves
- Pupils' exchanges were very short- 5 seconds on average
- Pupil answers were limited to 3 words or less 70% of the time

Positive influences of Using Maths Talk

- Talk can reveal understanding and misunderstanding.
- Talk supports robust learning by boosting memory.
- Talk supports deeper reasoning.
- Talk supports language development.
- Talk supports the development of social skills.

Teacher-student talk

Traditional teacher questioning

- Teacher asks a question
- Children put up their hands
- Teacher takes an answer
- Teacher accepts, rejects or develops the answer
- Teacher asks a further question

Children's responses are brief

Teacher steers the answers

What learning takes place?



4 Big Ideas

1. You have to make what everyone says and what you say understandable.

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3. You have to be able to develop and maintain student support with student engagement and motivation.

4 Big Ideas

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2. You have to manage coherence.
3. You have to be able to develop and maintain student support with student engagement and motivation.
4. **You have to be managing equitable participation.**

Talk Formats

Different ways teachers configure classrooms for discussions

- **Whole group** – provide students with practice reasoning opportunities
- **Small group** – provides opportunity for more loosely directed conversation.
- **Partner** – provides an opportunity for students who may have difficulty speaking up.

Productive Talk Moves

- 1. Revoicing:** (by the teacher) a student's contribution
- 2. Repeating:** Asking students to re-state another student's contribution
- 3. Reasoning:** Asking students to apply their own reasoning to someone else's reasoning
- 4. Adding On:** Prompting students for further participation
- 5. Waiting:** Using wait time

Revoicing

Clearing confusion with the correct math language.

This is about a student's contribution

- Elaboration, increase clarity of reasoning
- Bridge to more mathematical reasoning
- Set up alignments and oppositions
- Demonstrate attention and concern for student thinking and voice

“So you’re saying you added 3 tens plus 4 tens and got 7 tens?”

“So, you’re saying it’s an even number. Is that what you mean?”

Revoicing: What is it?

T: So is the sum going to be positive or negative?

S: Well, the thingy is over that way, so it's positive.

T: OK, so are you saying that our arrow is going to the right, past the zero, so it'll be positive? **Is that what you're saying?**

S: Yeah.

The teacher notes that the student is saying or thinking something, repeats part or all of a student's utterance, and **asks the student to verify whether her interpretation is correct**. Some people call this *verify and clarify*.

Looks like/ Sounds Like

In a whole group discussion a class discusses if 24 is an even or odd number.

Philip: “Well, if we could use three, then it could go into that, but three is odd. So then if it was...but...three is even. I mean odd. So, if it’s odd, then it’s not even.

Teacher: Ok, let me see if I understand. So you’re saying that 24 is an odd number?

Philip: “Yeah. Because three goes into it, because 24 divided by 3 is 8.

What is happening here?

- The teacher is confused at first, but then gets a clearer sense of what the student understands and doesn't understand.
- The student realises that the teacher **wants** to understand her contribution. Over time this can have a profound effect.
- The student can either accept or reject the teacher's interpretation , which positions the student as a legitimate participant in the intellectual enterprise.

(Confusion about what students have said is an extremely common-and sometimes embarrassing- state of affairs)

Revoicing

“I want everyone to hear that!”



Teacher: So you are saying you took
um....each lamington....



Teacher: Like this was one of your lamingtons...and you split this into quarters?



Girl: Yeah, and uh, like we labelled each person.....

One more example

Bringing out the greater significance



Teacher: So what you're telling me is that the definition ...of the variable...is a very important...idea in mathematics?



Student: Yeah



Teacher: Ok, it makes a whole difference of ...what the expression means?



Student: Yeah, it means that....

What is happening here?

- The teacher gets a chance to inject higher level vocabulary or ideas into the discussion while still maintaining contact with student ideas.
- The student gets to make the connection between what he said and this higher order formulation. Other students hear this too.
- The student gets credit-shares in this higher level version of what he said.

When teachers begin to use this move they gain:

- Time to think
- Ways to interact without embarrassment
- Insight into student thinking and knowledge

So once the students are externalizing their reasoning sharing their thinking out loud, how do you get other students to ***orient*** to that reasoning, ***to listen*** to it?



Restating

Asking students to restate someone else's reasoning.

This will:

- Build a community of active listeners
- Provide another phrasing of reasoning for students to engage with
- Formative assessment

“Can you repeat what he just said in your own words.”



Teacher: Put your hand up if you understand what she just said?



Teacher: OK, keep your hand up if you think you can repeat what she said.

Looks like/ Sounds like

Teacher: “Can anyone repeat what Philip just said in his or her own words? Anne?”

Anne: “Um, I think I can. I think he said that 24 is odd because it can be divided by 3.”

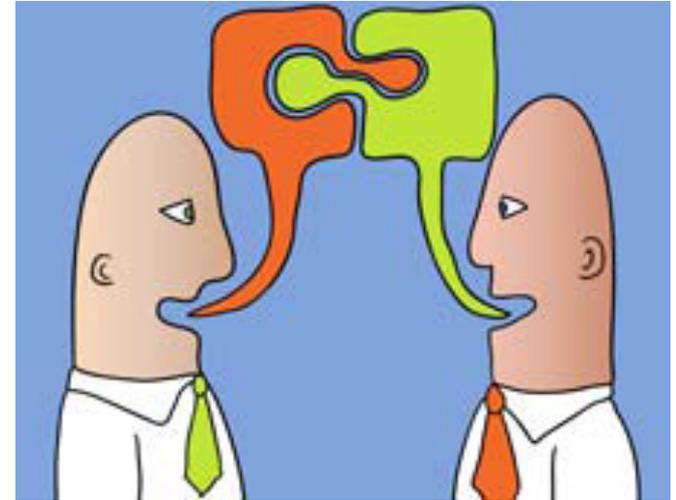
Teacher: “Is that right, Philip? Is that what you said?”

Philip: “Yes.”

Restate

Lets listeners know:

- that you are listening,
- that you are trying to understand them,
- that you care about their thoughts.



Restate

Restating is more than just repeating ...

- When you listen to Harry's ideas what comes into your mind from your own experience?
- What you say about ... is very interesting. Can you elaborate on it?
- Sue tells us ... and that is very like what Tom said when he described ... Is that right Sue and Tom?

Agree/ Disagree....Why?

Asking students to apply their own reasoning to someone else's reasoning.

This will:

- Encourage students to engage with one another's ideas
- Direct attention to reasoning rather than answers
- Make mathematical connections
- Promote community argumentation and justification

“Do you agree or disagree and why?”

“How is Joel's thinking similar to or different than Michelle's?”

Looks like/ Sounds like

Teacher: “Anne, do you agree or disagree with what Philip said?”

Anne: “Well, I sort oflike...I disagree.”

Teacher: “Can you tell us why you disagree with what he said? What’s your reasoning?”

Anne: “Because I thought that we said yesterday that you could divide even numbers by two. And I think you can divide 24 by two. And it’s 12. So, isn’t that even?”

Troubleshooting

Question:

What if a student I call on can't repeat or rephrase what another student has said? Or what if they refuse to?

Answer:

You can make it clear that it's perfectly fine to not be able to repeat or rephrase, but if a student who is called on didn't hear or didn't understand or can't repeat, they need to ask the original student to say it again.

Troubleshooting

Question:

What if a student repeats or rephrases what another student has said, but they get it wrong? Should I correct that or ignore it or what?

Answer:

When you're talking about complicated ideas, it's easy to misunderstand what someone has intended. You shouldn't be afraid to check back with the original speaker and ask "Is that what you meant? Did we understand you correctly?" Over time, this will help students become more resilient communicators.



Agree or Disagree? Why?

Well, I agree with what Steve said, because he said that like, he said that um, if you changed the four, it wouldn't really be seven fourths.



Well, I agree with
him, like, um,
but I disagree with
Lon...



because he said..

because, um, if it
was just four parts?



you could cut one
really small,
and one really big.

Add on / Say more

Prompting for further participation will:

- Increase opportunities for participation from a variety of students
- Get multiple solutions/ ideas on the table
- Push to deeper levels of mathematical thinking

“Would someone like to add on or share another method?”

“Who can add an idea to this discussion?”

**“Who can say more?
Can you give us an example?”**

Can you say more?

T: So how did you solve that addition problem?

S: Add.

T: OK, **can you say more?** Can you tell us more about how you did that?

S: Umm, I knew it was eight, and then I added on nine, ten, eleven.

T: So you used *counting on*! Is that right?

S: Yes.

Can you give an example?

T: What did your partner do while you put the puzzle together?

S: Wrote stuff.

T: OK, can you say more? **Can you give us an example?**

S: She wrote down what I did, ... like step by step.

T: OK, Ann, can you share some of your notes that your partner just mentioned?

Looks like/ Sounds like

Teacher: “So we have two different ideas here about the number 24. Philip, are you saying that 24 is odd because you can divide it by three?”

Philip: “Uh-huh”

Teacher: “And Anne, you are saying that it’s even because you can divide it by 2? Is that correct?”

Anne: “Yes”

Teacher: “Ok, so what about other people? Who would like to add to the discussion?”

Looks like/ Sounds like

Edward:

“Yes, I agree with Anne’s idea, because the only way we learned to find out if something is even is to divide by two.

And if we divide 24 by three , we can also divide it by 4.

And we can divide it by 6 too.

So I think we should stick with two only.”

Wait Time

Use wait time to encourage deeper thinking

”I will give everyone time to think about this question before sharing your thinking.”

Using Wait Time

Allows students time to think

Minimises student's tendencies to reason hastily

Increases opportunities for equitable participation

Using Wait Time

When **wait times** are increased in the classroom the following also increase:

- Number and Length of student responses
- Evidence of speculative thinking
- Students listening to each other
- Students asking questions
- Quality of the discussion
- Contributions from all students

Rowe, Mary Budd. "Wait Time: Slowing Down May Be a Way of Speeding Up."

AMERICAN EDUCATOR 11 (Spring 1987): 38-43, 47. EJ 351 827

Wait time

- Wait time or thinking time is used by teachers to give students time to consider their responses to questions, especially open questions.
- Research by Rowe (1972) found that when students are given more time to respond to questions their answers are longer, their responses more confident and failure to respond is less likely.

Wait Time

- Teachers typically wait less than one second after asking a question before calling on a student to answer (Wait Time 1).
- They wait even less time (usually 0 seconds) before speaking after a student has answered (Wait Time 2)

Implication:

- Silence can be golden.
- Both Wait Time 1 and 2 promote student thinking.

Expected Behaviours For Wait Time 1

What to do when the teacher asks a question:

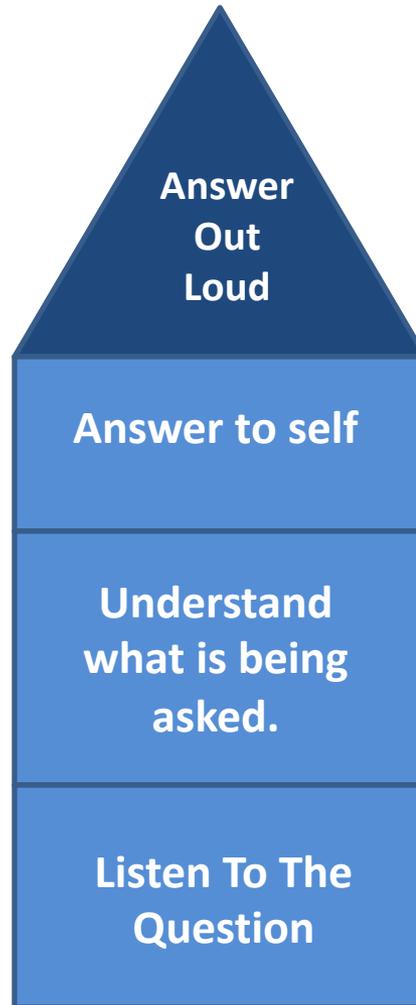
1. Listen carefully to the question.
2. Think about what the question is asking.
3. Use the silent time to match knowledge you have with the question.
4. Instead of raising your hand, wait to be called on.
5. Be ready to answer in a public speaking voice.
6. If you're not called on, listen carefully to your

Expected Behaviours of Wait Time 2

What to do during the pause after a student stops speaking:

1. If you are answering the question, use the pause to think about what you said and add to or change your answer.
2. If another student is answering listen to understand what he or she is saying.
3. Use the time to compare your answer with what was said.
4. Be ready to ask any questions or add further comments.
5. Demonstrate respect for your classmates when their answers are incorrect or different from your own.

Answering As a Process



This the section where typically teachers focus the most attention.

This is the step in which the student does or doesn't "find" an answer.

We often overlook the necessity of the second step- to understand the question.

The first step in the process is that students listen as the question is asked.

The teacher has given her students a series of numbers, and in a whole group discussion has asked them to say whether the numbers are even or odd.

They established the day before that if you can divide a number by two with no remainder, then it is an even number.

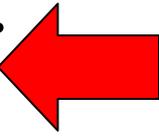
Joel has tackled the number 24. His contribution is less than completely clear.

Teacher: So Joel, is twenty-four even or odd? What do you think?

Joel: Well, if we could use three, then it could go into that, but three is odd. So then if it was . . . but . . . three is even. I mean odd. So if it's odd, then it's not even.

How to respond?

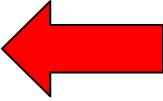
Teacher: OK, let me see if I understand.
So you're saying that twenty-
four is an odd number?



Joel: Yeah. Because three goes into
it, because twenty-four
divided by three is eight.

*Ah hah! a misconception!
Now what?*

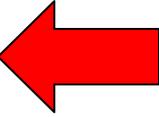
Teacher: Can anyone repeat what Joel just said in his or her own words? Christine?



Christine: Um, I think I can. I think he said that twenty-four is odd, because it can be divided by three with no remainder.

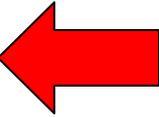
Are you sure she should repeat that?

Teacher: Is that right, Joel? Is that what you said?



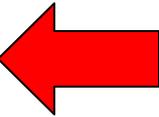
Joel: Yes.

Teacher: Katrina, do you agree or disagree with what Joel said?



Katrina: Well, I sort of . . . like, I disagree?

Teacher: Can you tell us why you disagree with what he said? What's your reasoning?



Katrina:

Because I thought that we said yesterday that you could divide even numbers by two. And I think you can divide twenty-four by two. And it's twelve. So like, isn't that even?

Teacher:

So we have two different ideas here about the number twenty-four. Joel, you're saying that twenty-four is odd because you can divide it by three with no remainder?

Joel:

Uh huh.

Teacher:

And Katrina, you're saying that it's even because you can divide it by two? Is that correct?

Katrina:

Yes.

Teacher:

OK, so take a minute to talk to the person next to you. Do you agree or disagree with Katrina's or Joel's ideas? **Talk to your partner.**

[Students talk in pairs for a minute. The teacher circulates and hears Robert talking to his partner.]

Teacher: Robert. Tell us what you talked about with your partner.

[15 seconds go by]

Robert:

Yes, I agree with Katrina's idea, because you tell us something is even is to divide by two.

And we can divide twenty-four by three, and we can divide twenty-four by four. And they don't get no remainders.

So I think we should stick with two only.

What is happening?

The concepts of "even" and "odd" are being sharpened and clarified, through bringing together different students' understandings.

Together, these understandings provide a space to engage with the idea more deeply.

4 Big Ideas

1. You have to make what everyone says and what you say understandable.
2. You have to manage coherence.
3. You have to be able to develop and maintain student support with student engagement and motivation.
4. You have to be managing equitable participation.

Productive Talk Moves

- **Revoicing** (by the teacher) a student's contribution
- Asking students to **re-state** another student's contribution
- Asking students to apply their own **reasoning** to someone else's reasoning
- **Prompting** students for further participation
- Using **wait time**

One more tool to help with all of
these steps...

Using your 'poker face' and
your 'poker voice'...



The harsh realities of the classroom

You can define and describe and “tell” the correct reasoning but there are certain to be students who:

- Didn't hear or weren't engaged
- Didn't understand and feel lost now
- Think they understand but they don't
- Have partial but weak understanding

Teaching Challenges



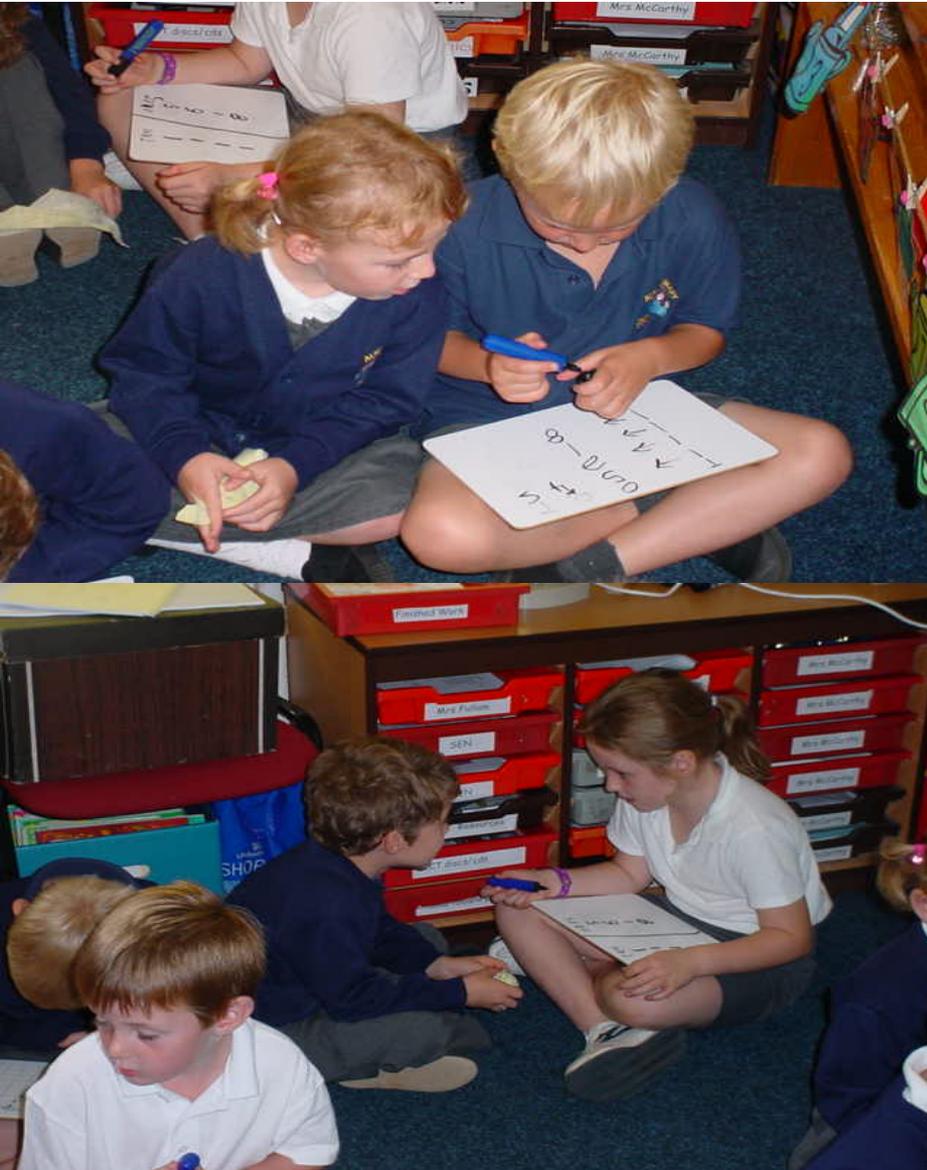
Talk Partners



Pupil talk is central to active learning. Establishing talk partners is often the first step teachers take in experimenting with formative assessment, as it is relatively straightforward to embark on and the impact can be seen immediately.'

Shirley Clarke 2008

Talk Partners



Literacy taking partners

Linus	Adam L	in	Rebecca
Leo	Imogen	Grace	Lorna
Isaac	Jade	Declan	Oliver
Olivia B	Anita	Adam P	Emily
Thomas	Ben	Sam	Lara
		Adam C	Joshua
		Olivia F	Jessica

Numeracy taking partners

Sam	Adam C	Thomas	Jessica
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Talk Partners



Prerequisites

Children must be able to;

- Listen
- Be receptive to alternative viewpoints
- Think about what they hear
- Give others time to think



This should enable students to:

- Narrate
- Explain
- Instruct
- Ask different kinds of questions
- Receive, act and build on answers
- Analyse and solve problems, speculate and imagine
- Explore and evaluate
- Argue, reason and justify
- Negotiate

What does it look like?

- Children listening carefully to each other
- Encouraging each other to participate and share ideas
- Building on their own and each other's contributions
- Striving to reach common understanding and agreed conclusions
- Respecting minority viewpoints

The Importance of Talking Partners

- Allows **all** children to think, articulate and therefore extend their learning
- Shy or less confident children have a voice
- Over-confident children learn to listen to others
- Generates a respectful, co-operative culture

Talking Partners

Has impact on learning because...

- It ensures all children contribute to solving the given problem.
- No child is left without a partner and unable to join in.
- It removes individual responsibility for an answer, making part answers expected and possible without losing face.

Introducing Talking Partners

Give the children talking partners.

Random..... Friends..... Ability

(Research has shown that random pairings are the most effective)

Wait time

No Hands Up

Picking Partners

- Pick Partners for the children to begin with and until children are comfortable with working in this way.
- Generally use ability pairings in Literacy and Numeracy and mixed in foundation subjects.
- Do what works best for you!

Talking Partners cont.

- Take a photo of each child. Place the photos in a box and draw out pairs randomly. Place photos in pairs on a display board.
- Complete 'compliment slips' before students change partners.
- Share the rationale with students. Spend time modelling and explaining talk partners at the beginning.

Talking Partners

1. Partners need to change regularly so that children experience different people's ideas and personalities.
2. The selection of a partner tends to be choose a paddle pop stick out of a tin on Friday.
3. Ensure, at the start of the lesson, that everyone knows who they will be talking to.
4. Check pairs for each lesson/day
5. Create Class ground rules
6. Magic spots



Rules Developed by Year 6

- Don't be afraid to speak up and give your opinion.
- Share your ideas with other people.
- Try to stay focused on the question or problem and not get distracted.
- Be polite and listen to your partners ideas.
- Two combined ideas are often better than two separate ones.
- Look at your partner when they are speaking, don't be rude.
- Take turns in listening and speaking, don't interrupt.
- Be prepared to admit that other people's ideas might be better than yours.

Turn and Talk



1. Sit crisscross applesauce.

2. Eye to eye. 

3. One friend talks  , one friend listens. 

4. Switch. 

How to be a successful Talking Partner

- Sit knee to knee
- Look at your partner when they are talking
- Look interested
- Let your partner express his or her views
- Say more than one or two words
- Be prepared to compromise
- Respect the views of other people



Talk Partners

This morning our talk partners were telling each other about their holidays and then suddenly she was picking names out of the tin and she picked me. I was a bit nervous about talking about my talk partner's holiday but then I started speaking and I did it.

To Matthew

Thanks for being a great talk partner!

I really enjoyed learning with you because ...

You made me more happy
to share my ideas to
the class!!!



from William

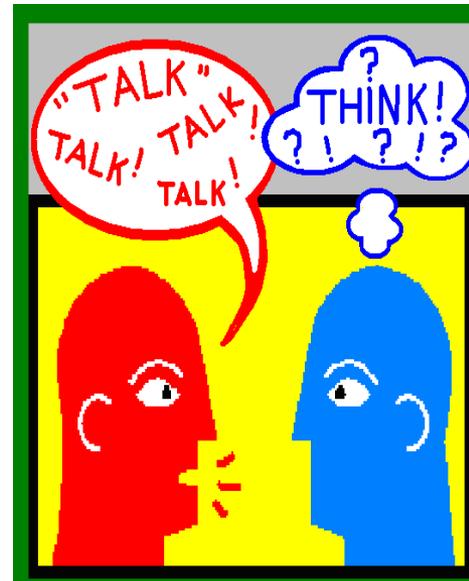
Read, Write and Talk



Talk Partners

As a plenary or a starter referring to the last lesson, pupils share with a partner:

- 3 new things they have learnt
- What they found easy
- What they found difficult
- Something they would like to learn in the future



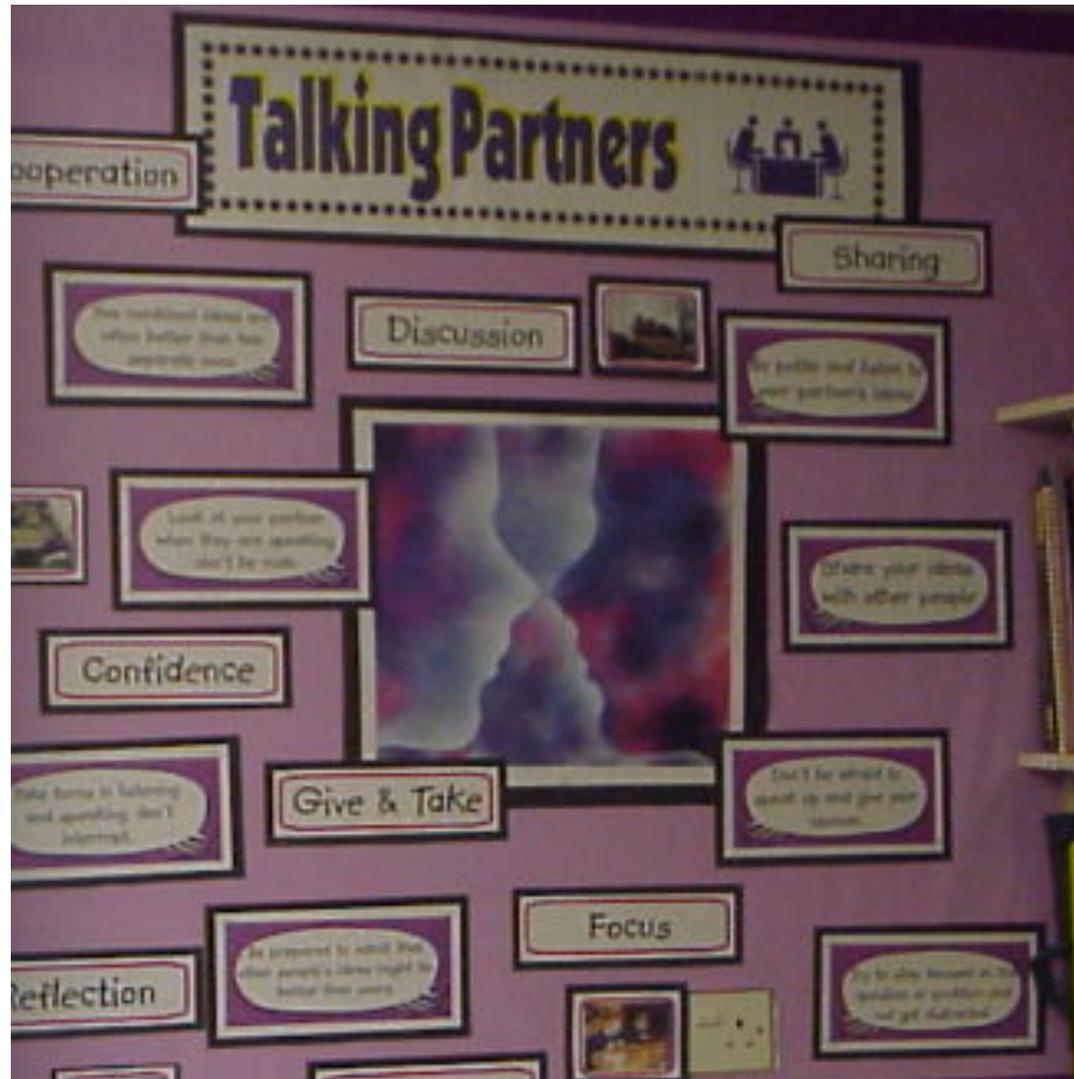
Talk-Partners' Agreement

I will try to:

- ❖ listen carefully to my partner;
- ❖ look at my partner when they are talking to me;
- ❖ take an interest in what they are saying;
- ❖ use encouraging body language and facial expressions;
- ❖ let my partner say what they wish to say;
- ❖ listen to, and think about my talk-partner's ideas;
- ❖ be patient;
- ❖ not to interrupt;
- ❖ give reasons for my opinions, ideas or arguments;
- ❖ accept that my partner might not agree with me;
- ❖ respond to what my partner says;
- ❖ share and explain my ideas and what I already know;
- ❖ compromise if our opinions differ;
- ❖ accept responsibility for decisions;
- ❖ not claim credit for all the good ideas;
- ❖ not blame my partner for any mistakes.

“Talk partners have widened children’s social understanding and increased their tolerance of other people.”

Display



Display



Unwilling Children

If any children seem unwilling to talk to their partner try pairing them with a friend for a short time until they become more confident.



What the children think

- “It’s exciting because you get to share.”
- “I like having someone to check my work before I show it to my teacher.”
- “It’s nice being allowed to chat to the person next to you.”
- “You learn from your partner.”
- “You have to explain to your partner.”



Effective Questioning

In order for talking partners to be successful, you need a question that requires discussion.

“More effort has to be spent in framing questions that are worth asking, that is, questions that are critical to the development of student understanding.”

Black et al 2003

Ground Rules for Respectful Talk

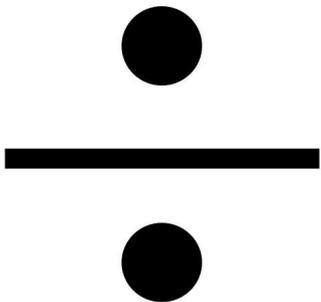
- Students listen to each other with respect and courtesy.
- No name calling or remarks ever allowed.
- It is okay to disagree.
- Establish clear consequences for violation of these rules.
- Establish conditions for full participation:
 - Every student needs to listen to what others say.
 - Every student can hear what others say
 - Every student may participate by speaking out at some point.

Ground Rules for Respectful Talk

1. Hear the speaker
2. Listen and try to understand
3. Ask questions when we don't understand
4. Speaker needs to try hard to be clear
5. Everyone has a right to participate

What Mathematics Should We Talk About?

- Mathematical symbols, vocabulary and terms
- Mathematical reasoning
 - Induction/ deduction
 - justification



Practical Ideas

- ABCDE Cards
- Mini whiteboards
- Thinking Thumbs
- Fist to Five
- Exit Passes
- Randomisation

Our goal is not to increase the **amount** of talk in our classrooms

but to increase the **amount of high quality** talk in our classrooms-the mathematical productive talk.