Clough N 2010 *'Improving ITE through attending to children's mathematical talk'* in Leading Partners in Mathematics: Pilot Project:

Materials submitted for the National Strategies website to be published in Autumn 2010

The six 'hot text' screens are designed to be hyperlinked on the web pages to the 24 Items included here. These materials have already been shared by Clough N at national training events organised by National Primary Strategies for ITE mathematics tutors working in HE

Hot text	
Screen number	1
Screen objective(s)	**Over-arching aim and summary**
Title	Summary of the project
Initial text (50 words)	Summary Leads into describing aims and outcomes (briefly) below A concern to build Initial Teacher Training (ITT) partnerships that focus on children's learning – and thus engage teachers and trainees in professional development together - leads to a small scale mathematics ITT/ CPD project. Trainees and teachers develop opportunities for children to engage in mathematical investigations that stimulate high quality talk (HQT)
Hot text 1 (8 words)	**Aims** **Improving ITT through attending to children's mathematical talk**
Hot text 2 (8 words)	Impact on learning: Trainee teachers Focus on children's talk enhances achievement against standards
Hot text 3 (8 words)	Impact on learning: Teachers and mentors Engagement in ITT supports own development as effective practitioner
Hot text 4 (8 words)	Impact: Local Authority Material available to support teacher development programmes
Hot text 5 (8 words)	The DIFFERENCE it made. Enhanced learning for trainees, children and teachers
Hot text 6 (8 words)	Area of maths featured HQT in mixed ability guided group work
Display text 1 (50 words)	List aims in bullets • To identify high quality talk in mathematics • To discern the value of talk for learning in mixed ability guided group work in mathematics • To explore the impact of the above on children's learning and the professional development of trainees and teachers • To stimulate engagement of other school based mentors and trainees in focussing on children's talk

	• To include what has been learned about children's talk in mathematics in subsequent centre-based initial teacher training and mentor training sessions
Display text 2 (50 words)	Brief description of intended impact • To build on what trainees had learned about the value of children's talk within mathematical investigations during centre-based training • To encourage trainees to encourage and evaluate children's mathematical talk during investigations • To enhance trainees' understanding of the significance of children's talk for learning • To prove trainees' outcomes against the standards for QTS
Display text 3 (50 words)	Teachers and school based mentors learn more about • the value ITT that focuses on children's learning • open ended mathematical investigations that stimulate HQT • the nature and contribution of children's mathematical talk in mixed ability groups • the importance of the above for the purposes of initial teacher training and school-based development
Display text 4 (50 words)	Brief description of intended impact • Teachers in schools where the outcomes are disseminated want to become involved in this form of ITT • Evidence-based evaluation of the project is available to support professional development at school-level
Display text 5 (50 words)	Brief description of difference made – this will be unpacked in more detail later • 4 trainees were facilitated in applying the principles of open ended mathematical investigational work during their professional placements. • Children value the opportunity for engaging in different kinds of mathematics lessons. • Trainees use children's utterances as a basis for discussing learning and achievement in mathematics. Teachers adopt elements of investigational and mixed ability work. • Dissemination stimulates interest of other school-based mentors.
Display text 6 (50 words)	Area of maths featured and why chosen • Using and applying mathematics This provided opportunity for children to evidence mathematical knowledge and understanding that they already have • HQT There was a need to establish HQT in mathematics as a medium for evidencing children's capacity for reasoning and learning

	• Guided Group work Supporting children's independent learning during mixed ability group work is challenging for trainees and teachers alike.
Graphic description (optional)	
Resources	
Notes	

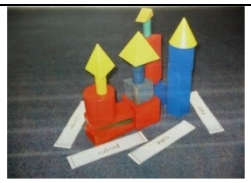
Hot text	
Screen number	2
Screen objective(s)	To provide context
Title	**Background – setting up the project**
Initial text (50 words)	Context and scope – brief summary leading to: An Initial Teacher Training / Continuous Professional Development (ITT/CPD) project was carefully designed to enable trainees and teachers to work collaboratively to plan open ended classroom activities that • stimulate children's high quality talk (HQT) in mathematics • provide access to children's thinking and reasoning skills • promote new understandings about teaching and learning in mathematics. Who was involved?
Hot text 1 (8 words)	Teachers 4 teachers (Y2-Y4) interested in developing their mathematics teaching
Hot text 2 (8 words)	Local Authority 3 Local Authorities serving the ITT partnership
Hot text 3 (8 words)	Trainees 4 trainees interested in developing their mathematics teaching
Hot text 4(8 words)	University tutors The ITT mathematics team and Director of ITT
Display text 1 (50 words)	Brief description e.g. maths specialists/people who work with university regularly The 4 teachers presented themselves from the wider group of teachers who were supporting trainees during their final placement. An advertisement was circulated to all schools. In one case the teacher was advised previously of the project because of his known interest in developing approaches to mathematics teaching and decided to take a trainee as a result.
Display text 2 (50 words)	Which LA? Why that one? The LAs whose schools are represented in the IT partnership were invited to participate in the project. There were 2 schools from the City Bristol, 1 school from South Gloucestershire and 1 from North Somerset. This

	will facilitate the dissemination of the outcomes of the project through the cluster groups in those LAs.
Display text 3 (50 words)	Which trainees? Why selected Trainees were selected on the basis of their known enthusiasm for developing approaches to mathematics teaching and learning. They had all been successful on all previous professional placements, though their grades in relation to the standards were varied. They were all generalist primary trainees.
Display text 4 (50 words)	Which tutors? Why them? The team of mathematics tutors supporting primary ITT programmes collaboratively developed the project rationale and approach together with the Director of ITT who had particular insights into the partnership arrangements. The Director of ITT took responsibility for supporting the documentation of the outcomes for the trainees, teachers and children.
Graphic description (optional)	
Resources	
Notes	

Hot text	
Screen number	3
Screen objective(s)	To show what was planned
Title	What was planned - setting up the project
Initial text (50 words)was	Brief outline. Issues in structure and organisation. Identify these as hot text, leading to unpacking in display text The overall plan that was shared with participants allowed for a process of re-iterative dialogue – a series of shared actions and subsequent reflections. The sample size was deliberately small to encourage significant learning partnerships to develop. The preference for an open ended investigative approach was established through an initial participative training session.
Hot text 1 (8 words)	Limited number of participants for effective learning partnerships
Hot text 2 (8 words)	Efficient stimulus to promote diverse effective mathematics activities
Hot text 3 (8 words)	Opportunities for collaborative reflection and discussion of activities
Hot text 4 (8 words)	Opportunities for reciprocal visits to each others classrooms
Hot text 5 (8 words)	Opportunities to share the learning through discussion and interview
Display text 1 (50 words)	The activities outlined in the plan – including three training / planning / reflection sessions at the University and reciprocal visits to each other's schools – allowed positive professional relationships to develop. There was a strong sense of ownership by the participants of the work of the project – and a commitment to fulfil the responsibilities given.

Display text 2 (50 words)	Participants were given a cardboard hand 40 cms in length and were asked to make a 'to-scale' 2D representation of the giant whose hand it was! The trainees had previously undertaken the task and the teachers agreed to be observed as they responded to the task. The trainees noted the types of talk that they used.
Display text 3 (50 words)	A highlight from the interim evaluation was the high value placed by teachers and trainees alike on the time given for planning the activities. The dedicated planning session was deliberately timed to follow the initial training and subsequent period of experimentation with HQT in the classroom. Thus the key ideas were already partly embedded.
Display text 4 (50 words)	This opportunity was valued by teachers and trainees alike as they made one visit to their paired school. In particular it provided opportunity for the project team to consider the application, during their observation of a trainee's lesson, of the paper shared within the project 'Observing High Quality Talk'.
Display text 5	Each setting and classroom was visited by a University staff member towards the end of the project to facilitate an evaluation of the activities that are presented here.
Graphic description (optional)	
Resources	
Notes	

Hot graphic	
Screen number	4
Screen objective(s)	**What was done and when and how?**
Title	Project timeline
Initial text (40 words)	Events/activities involved e.g. • Centre-based • School-based • What trainees did • What teachers / mentors tutors did • What the children did Include in display text for each of the above: • Challenges and how overcome • Resources developed • Alterations made from original aims • Impact - which emerged as project progressed (brief as this will have a separate screen next) The flow of activities in the original plan was accomplished. The challenge of identifying the nature of HQT in mathematics was brokered through examples shared at centre-based meetings. The resources developed took the form of mini-challenges that were relevant to the children's interests.
Display text 1 (80 words)	Centre-based activities The stimulus activity of the planning session is already described in section 3. A significant stimulus was provided through joint consideration of children's mathematical talk related to Castes which is further analysed in section 5. This was important as there was a residual concern, in spite of the introductory activities, that HQT in mathematics might be beyond the reach of some children. The relevant children's utterances are recorded in this link.
Display text 2 (80 words)	School-based activities It is interesting to note that the resources that were developed largely took the form of 'min-challenges' that were relevant to the children's interests. The variety of these enriched the project as it was interesting to note the different ways in which children used and applied their mathematical knowledge and skills.
Display text 3 (80 words)	Trainees' initiatives Four separate initiatives resulted from the original stimulus and the planning event. In School One, the focus shifted from an early activity related to constructing Castles into a series of mini investigations related to Change and Measurement. In School Two, the focus on the language of time was sustained through the creation by the children of board games. In School Three the activity of designing Teddy Bears' Jackets stimulated mathematical engagement

	In School Four children engaged in designing biscuit packaging
Display text 4 (80 words)	Teachers' contributions The commitment of the teachers to the implementation of the plan was crucial. In each case they prioritised the following • Agreeing to participate in a learning project alongside the trainee • Joint planning of activities with the trainee • Allowing space for mathematics talk sessions in their classrooms • Participating in the reciprocal visits with another school • Supporting the trainees' reflection process • Using the 'Observing High Quality Talk' audit • Recognising the trainee's professional development against the standards
Display text 5 (80 words)	What the children did Some children observed that they were doing something different than expected in a mathematics lesson. While they may not immediately have recognised the activity as work, nonetheless in each class they were successfully engaged in 'doing' purposeful talk. These new actions – talking – did pose a challenge to the trainees – how best to document and assess 'talk' which without due attention could evaporate and disappear without trace. As a consequence of the project trainees needed to develop new ways of recording and reflecting on what the children did.
Display text 6 (80 words)	
Graphic description	Pictures to represent above – these will link to display text
Hotspot 1	Link to file of children's talk about castles and picture
Hotspot 2	
Hotspot 3	   

	 Link to School 4 description / evaluation
Hotspot 4	Link to i) 'Observing High Quality Talk' audit ii) details of the reflection process identified in the plan
Hotspot 5	
Hotspot 6	
Resources	
Notes	

Hot graphic	
Screen number	5
Screen objective(s)	To summarise the impact of the project.
Title	Impact of the project
Initial text (40 words)	Impact and verification - evidence Tool and approaches for evaluating / measuring impact (could include link to a document) The evaluations at interim and final stages of this ITT project evidence enhanced learning and development for children, trainees and teachers. The success criteria of the project related to the significance of children's mathematical talk for learning and for enhancing ITT processes have been achieved at least in part.
Display text 1 (80 words)	Impact on children's learning Indicative case study material from school 4 at both interim and final stages illustrate the ways in which children were advantaged by an open ended investigational approach to mathematics which complemented the current schemes of work. Examples (Exploratory talk.pptx, Scaffolding talk.pptx, Collaborative questioning and justifying.pptx, Applying knowledge.pptx) of children's utterances are presented to illustrate some of the different kinds of talk that were evidenced through the practice. Parents have also commented favourably about their children's excitement about the mathematics activities.
Display text 2 (80 words)	Impact on trainee teachers' learning All the trainees had markedly improved results against the standards in this professional practice. They attribute

	this success in great part to the particular focus of the maths project. Where it was possible, all trainees improved by a full grade with respect to both 'subject knowledge' and 'professional skills'
Display text 3 (80 words)	Impact on teachers/mentors/tutors In 3 schools the teachers have continued with this focus on promoting high quality talk in mathematics through mixed ability teaching. In the fourth school there was already a strong focus on children's talk for learning. The teachers have expressed a strong interest in sharing the outcomes of the project with other trainees during centre-based training during 2010-2011. Each teacher is keen to continue receiving trainees on their final placement with a view to continuing with this focus.
Display text 4 (80 words)	Impact on ITT provision The outcomes of the project have already been shared with teachers who supported PGCE trainees on their final placement in May – July 2010. There is evidence from their responses that this ITT/CPD approach was one that others wanted to participate in 'developing learning projects together – children, trainee and teacher'. In one session 9 out of 14 teachers proposed an intervention that included a focus on children's talk as a means to improve outcomes for trainees and children (as recorded here)
Display text 5 (80 words)	Impact on partnership – school-based training As indicated above the project has supported the developing intention to improve ITT provision through a focus on children's learning. This project is a significant facet of this development together with the successful 'Leaders in Literacy ' project.
Display text 6 (80 words)	Impact on LA consultants (if appropriate) There is ongoing discussion about how this successful project can be furthered during 2010 – 2011. Already, in May 2010 one of the schools has engaged with 2 new schools in a 'Maths and Creativity Project' funded by Creative Partnerships. With the same team from the University also involved there has been a continued focus on high quality talk as prompted by open ended investigational approaches. The pilot of this new initiative has had similar successes.
Graphic description	Series of pictures to represent each of the above

Hotspot 1	
Hotspot 2	
Hotspot 3	
Hotspot 4	
Hotspot 5	
Hotspot 6	
Resources	
Notes	

Hot text	
Screen number	6
Screen objective(s)	To summarise lessons learned and next steps.
Title	Lessons learnt and next steps
Initial text (50 words)	Brief summary of potential for application for other ITT providers and for yourself Evidence from the project has added weight to the argument that the promotion of children's learning should be the prime focus for ITT. Through engaging teachers and trainees in working together towards this end, new materials have been developed to support centre-based training. The process is efficient, effective and replicable across the partnership.
Hot text 1 (8 words)	Partnership Strengthening rationale for schools' engagement in ITT
Hot text 2 (8 words)	Centre-based learning New materials and trainers available to support ITT
Hot text 3 (8 words)	School-based training and Mentoring Model for mentors: Developing a learning project together
Hot text 4 (8 words)	Core areas of mathematics Using and applying mathematical skills and knowledge
Hot text 5	Next steps An open ended cycle of stimulus, change and learning
Display text 1 (50 words)	Describe lessons for partnership In a period when there is national recognition of challenge involved in securing high quality placements for trainees, such projects are very helpful. The dissemination of the project's outcomes for children's learning is providing a strong argument for the case of a school's engagement in ITT.
Display text 2 (50 words)	Describe lessons for centre-based learning A key lesson is the need for strong cohesion between centre-based and school-based training. The trainees in this project have previously looked for opportunities to engage children in open ended investigations following their experience in training sessions at the University. The University has a key role in supporting schools in trialling these approaches to enrich current curricular practices.

Display text 3 (50 words)	Describe lessons for school-based training and mentoring The enthusiastic response of the mentors with PGCE students to the dissemination of this project suggests that it is timely to build on this success. A more pronounced focus on the significance of children's mathematical talk for deepening trainees' subject knowledge is likely to ensure wider participation in this learning project.
Display text 4 (50 words)	Describe key lessons in relation to core areas of mathematics Children's exploratory talk emerges as a natural outcome from the design of appropriate mathematical investigations in mixed ability settings. As they solve mathematical problems, children's talk is seen as a representation of their capacity for mathematical thinking. Children display the capacity to apply and further develop their knowledge and skills when engaged in this way.
Display text 5 (50 words)	Where next in relation to developments across the partnership within mathematics and beyond? These cyclical questions continue to inform the further development of ITT approaches across the partnership • What does HQT look like in mathematics? • What circumstances lead to it occurring? • What and whose learning develops? • How transferable is this kind of work? • What opportunities arise for centre-based and mentor training? • How is the practice best disseminated?
Graphic description (optional)	
Resources	
Notes	

Item 1

Applying knowledge

- **Child 2:** Not a single crack.
- **Child 3:** I think I can give this 100%
- **Child 1:** 100%
- **Child 2:** No cracks at all.

Trainee commentary
I did not mention percentages at all. When I mentioned they could rate the success out of 100, maybe I thought about it but I never thought they would. They were outside in their little groups – saying this looks like about 60% of the biscuit has been broken. There is 40%

left. When they were rating they would say I would give this 90 out of 100 so 90% - thy were linking it themselves. I was shocked! I was not expecting that. I had not thought they could use or apply it.

Item 2

Child outside: *We are building a castle. This is the floor.*

Child cutting a zig-zag *Big, small, big, small it makes a pattern!*

Child constructing with lego: *I'm making pyramids. I saw them in a book. I'm showing the others how to make one.*

Stephen's castle: *Mine's going to have a big tower. People could poke their heads out of the window, you could climb up the towers until you get in through one of the holes and then you will be king. That 's the top of the castle*

Ella's castle: *I'm trying to make the stairs. You can climb up inside and the princess and the queen and the people who live in this castle look up. That's the stairs.*

Item 3

Collaborative questioning and justifying

- **Child 1**: Can we do a cylinder? Because that's what digestives are usually packaged in.
- **Child 2:** A pyramid and a cylinder. A pyramid because my favourite chocolate is packaged in a pyramid.
- **Child 3:** Pyramid it has 3 sides and it will land on one of these sides.

Item 4

Extracts from the description and evaluation by the trainees of her activities in School 4

The activities related to linking data handling with investigations about shape

The task involved groups of mixed ability children in

- Designing 3D packaging that best protects biscuits from i) drop ii) throws
- Communicate your findings - justifying your decision about which 3D shape offered best protection.

The shapes that they were testing were rhombic prism, cube, cuboid, cone, cylinder, pyramid, pentagonal prism and dodecahedron

They immediately engaged in the activity and evidenced capacity to communicate their approaches to solving the problem using appropriate vocabulary and relevant understandings

Two examples of recorded talk from the activity

Child 3: I think a cylinder will be strong as it's not just a rolled up piece of paper it has circles on the end.
Child 2: Yes but another reason why I don't think it will be strong is that it's thin, now I think a cuboid might be quite strong.
Child 4: Yeah a cuboid might be really strong as it won't roll and if you hit it like that (hits it on the sides of the cuboid) it won't do any damage to the biscuit.

Child 1: Can we do a cylinder? Because that's what digestives are usually packaged in.
Child 2**:** A pyramid and a cylinder. A pyramid because my favourite chocolate is packaged in a pyramid.
Child 3**:** Pyramid it has 3 sides and it will land on one of these sides.

They all engaged with enthusiasm in the task of testing their packaging. Not all of the packaging was as successful as this recorded talk suggests

Child 2**:** Not a single crack.
Child 2**:** I think I can give this 100%
Child 1**:** 100%
Child 2**:** No cracks at all.

When asked what they had learnt from the investigation, the children explained which shape they had found as a class was the best shaped packaging, identifying and naming the 3D shapes.

One of the children also talked about his reasoning for the shapes being the best, he talked about scientific concepts such as force and friction that could have helped the shapes protect the biscuits. The children also talked about how they had learnt how to create the shapes using nets, and create a bar graph to show their results using a laptop.

I have also been able through this study to understand the gain of using investigational activities within the mathematics classroom to firstly promote the use of talk, and secondly in being able to give the control of the lesson over to the children. I believe that this has shown to be an effective way of promoting high quality talk, and would hope to continue the use of group investigations within my future practice.

What have I learned about knowledge and mathematical subject knowledge? That knowledge of maths should be seen as a whole. I had it down as shape and then using data handling. Then the children brought in all these other aspects, for example, halving, averaging, division, addition, percentages, I began to see maths as cross mathematical. I think this is pedagogical.

Item 5

Details of the reflection process build into the project plan

Monday February 8 PM: Review / further development of training and assessment
(Director of ITT, UWE maths team, class teachers and trainees)
Sharing practice of activities. Sharing outcomes from observation and feedback

- Support for plans to evaluate impact on children's learning and trainees' capacity to teach mathematics

Monday 22 February – Friday 12 March
(Class teachers, UWE maths team)

- Continuing activities to promote high quality talk in mathematics lessons
- Weekly feedback to trainees (3 observations)
- Reciprocal visits by class teachers to partner school for joint observation (supply cover)
- Support for developing video material of selected teaching sessions

Friday 12 March PM session. Supporting the evaluation process
(Director of ITT, UWE maths team, class teachers, trainees)

- Sharing outcomes from observation and feedback. Sharing case studies and school documentation
- Making recommendations for further development of ideas to promote high quality talk in mathematics
- Further consultation about subsequent contributions to centre-based training
- Preliminary documentation of outcomes to support the preparation of the report

Item 6

Exploratory talk. Children reasoning about their choice of design
Child 3: I think a cylinder will be strong as it's not just a rolled up piece of paper it has circles on the end.
Child 2: Yes but another reason why I don't think it will be strong is that it's thin, now I think a cuboid might be quite strong.
Child 4: Yeah a cuboid might be really strong as it won't roll and if you hit it like that (hits it on the sides of the cuboid) it won't do any damage to the biscuit.

Item 7

Phase	Intended impact	Target	Evidence	Impact
27 Jan -8 Feb	Awareness of nature of high quality talk in mathematics Development of a focus on teachers' / trainees' skills re hqt. Timing, Facilitation, Supporting, Noting Learning , Judging when to move on, Evaluating how to build on	Teachers	From engagement in practical activities 27/1. 1) Negotiating length of break time 2) The Giant's Hand	Significance of EYFS teacher in group Types of talk identified e.g. planning, delegating, naming, measuring, positioning, negotiating, estimating, evaluating, testing, checking .....,
		Trainees	High level of confidence and engagement in practical activities	Trainees' experience of experiential / interactive teaching and learning is consolidated through working alongside teachers
	Awareness of indicators of use of high quality talk	Trainees	Trainees confident to evaluate the use of the teachers talk as they engage in the activity	Confidence gained from practice of observing teachers
	High interest in planning maths sessions with high quality talk in mind		Acceptance of task for following week: select a theme, maximise opportunities for hqt in everyday mathematics sessions, look at impact on children's learning, look at impact on trainees' professional skills	Differentiation of children's hqt pre / during / post activity. Significance of talk inside / outside
	Awareness of what hqt is in context of classroom	Children's learning	Sample feedback 8/2 from teachers and trainees Child outside: *We are building a castle. This is the floor.* Child cutting a zig-zag *Big, small, big, small it makes a pattern!* Child constructing with	Teachers and trainees share ways in which they identify mathematical content in children's utterances

			lego: *I'm making pyramids. I saw them in a book. I'm showing the others how to make one.* Stephen's castle:*Mine's going to have a big tower. People could poke their heads out of the window, you could climb up the towers until you get in through one of the holes and then you will be king. That 's the top of the castle* Ella's castle: *I'm trying to make the stairs. You can climb up inside and the princess and the queen and the people who live in this castle look up. That's the stairs.*	
	Support for categories of talk identified to support feedback	Trainees Teachers	To be gleaned from practice	Acceptance of categories as applicable to training context
	Engagement in curriculum planning activity to promote high quality talk	Trainees Teachers	Themes identified: Shape in packaging, Problem solving re Time, Growth / Measuring, Frameworks emerging e.g. 1. Identifying stimulating lead question 2. What we know already, what we did, what we found out, 3. High quality talk in preparation leading to high quality talk in the classroom 4. Allowing time – space for children, letting them walk through the learning encounter, 5. Leading prompt to stimulate ideas and talk 6. What will the children's talk tell us	Recognition that planning for hqt requires time and collaboration Need to focus on intended learning for children. Talk is the medium for engagement

			about their understanding of	
21 Feb – 12 Mar	Children's learning is a focus for discussion in the training process Trainees develop pedagogical skills Trainees are more conscious about their levels of pedagogical competence Teachers are engaged in supporting the development of trainees' pedagogical skills Teachers are more conscious of their pedagogical skills Fresh understandings of 'talk for learning' that can be shared across training environments Children's learning is enhanced Partnership is strengthened through this focus on pedagogical skills	Trainees Teachers Children SBMs	Evidence gathered during Reciprocal visits to classrooms by teachers and trainees Recorded episodes of talk between trainees and children Visits by UWE staff on March 10 Visits by UWE staff with consultant on 11 / 12 March Training session on 12 March Visits by Link tutors in wb 22 March	These are summarised in the Interim Reports which are linked. School 1 Interim Reflections School 2 Interim Reflections School 3 Interim Reflections School 4 Interim Reflections Key statement s12 March

Item 8

Identified aims of the project

- To identify high quality talk in mathematics
- To discern the value of talk for learning in mixed ability guided group work in mathematics
- To explore the impact of the above on children's learning and the professional development of trainees and teachers
- To stimulate engagement of other school based mentors and trainees in focussing on children's talk
- To include what has been learned about children's talk in mathematics in subsequent centre-based initial teacher training and mentor training sessions

Item 9

University of the West of England BRISTOL

The National Strategies

Invitation to join funded training programme

How can we promote high quality talk in mathematics?

Who can participate?

Schools and early years settings offering placements for UWE year 3 students in the spring term

Overview

Class teacher and mathematics coordinator in each school with a student joins a funded learning partnership December 2009 – April 2010 to further improve initial teacher training in their school

Benefits

Supply cover for meetings and development sessions

- Sharing expertise in mathematics teaching across a learning partnership of 4 other schools with UWE trainees
- Support from specialist mathematics tutors from UWE

Innovative materials developed for stimulating high quality talk in guided mathematics group sessions

- Funded visits to a link school to observe / support high quality talk in mathematics
- Practice in assessing children's talk in mathematics

Materials developed to support sharing of the project – for future work with trainee teachers and other practising teachers / HLTAs

Invitations to support training sessions at UWE

Outcomes

Each teacher's own professional development

Improved capacity of trainee teachers to teach mathematics

Children's learning opportunities and attainment enhanced through innovations

Teacher training programmes enriched in future years

New relationships between EY / primary teachers

How can we promote high quality talk in mathematics?

Picture Source Clough N and Holden C 2002

Item 10

Key statements from teachers and trainees at the end of the joint reflection day.
Hand it over to the children
Put mathematics learning into a context that is motivational, fun, productive and purposeful
Give maths a purpose.
Ability to talk needs to be rehearsed.
Engage in meaningful conversation rather than instruction. Put self on the level with the children. Be expressing this idea – what can we learn together
Talking is evidence of a level of thinking,
The task is the medium
Children's talk is evidencing the level of their thinking
Talking develops mathematical thinking
We need to change our perception of the capability of children

Item 11 (Adapted from source Gill Woods)

Observing High Quality Talk in the DML

Date: _____ Year Group: _____

Theme of Lesson: _____

Children talking

1. **Types of talk**

Do the children

- Demonstrate and explain?
- Ask questions?
- Describe?
- Reason?
- Justify their answers?
- Hypothesise?
- Evaluate?
- Predict?
- Generalize?

What does the teacher do to encourage the children to do any of the above?

2. **Organisation of talk**

Do the children discuss with the whole class/small group/another adult/talk partner?

- Are the children invited to feedback after these talk times?
- Does the teacher follow through the children's suggestions?
- How much talking time does the teacher give the children?

3. **Social elements**

- What does the teacher do to encourage the children take turns to talk?
- What does the teacher do to encourage the children to listen and respond to each other?
- Do the children know what the features of effective talk are?

Teacher Questioning

1. **Question type.** What types of questions does the teacher ask?

- Factual questions?
- Speculative questions?
- Process questions?
- Procedural questions?

Give examples.

How do the children respond to these?

2. How much **time** does the teacher allow for thinking?
3. **Who** does the teacher ask to answer? Why?

Mathematical Vocabulary

1. Is any new vocabulary introduced during this lesson? If so what?
2. How does the teacher introduce it? Does s/he encourage the children to use it? If so how?

Resources

1. What resources are used during **whole class** teaching? Does the teacher's use of resources encourage the children to engage in high quality talk? If so, how?
2. What resources are used **by children** during the lesson? Does the children's use of resources encourage the children to engage in high quality talk? If so, how?
3. Do other adults encourage the children to talk? How do they do this?

Item 12

School 1

Board game: maths challenge; teacher role as facilitator

Key skill; communication. Process skills

Steps through different language use – brainstorming, questioning, developing vocabulary, making game , showing game, reflecting

One mixed group lower ability, keeping focus hard.

Creating the questions: Some groups asking simple questions 'how many days in 3 weeks?' , up to 4 players, Instructions, Others more complex - If H is 12 how old will he be in 32 years time,

Social interactions, rules of engagement, communication skills, postscripts from teachers – silent way of providing guidance, the owning of the dialogue by children

Objectives always set per day, thus small scale challenge

The idea came to the trainee and the teacher in the car on the way back

Evidence: taped conversations, postscripts from teachers, games and instructions created by children

School 2

Packaging, mixed ability, testing, dropping, throwing, packages, biscuits,

Children's own inventions: % number, halving, all emerged within the discussion, rating out of 100 converted into use of %, computer,

Subsequent tasks: write to biscuit company, interview each other,

Motivations: giving a purpose to solve, letting them just do it.

Scale: Every day a question, small, manageable scale

Reasoning Children articulately justify why rhombic prism was the best, disproved earlier hypothesis that hexagonal prism was best

Application, stacked on shelf,

Investigative approach led to higher order talk – including synthesising,

Children's capacity for reflection: sometimes best talk was after the event, possible use of video footage to stimulate metacognitve talk

School 3
Adaption of Giant's Hand activity. Children using non standard measures,
Type of talk More able took on instructor role, others needed an adult to guide them,
Prior experience Children may need to develop skills first as a grounding,
Finding appropriate strategies: talking partners did not work, need for adults to lead, comparing heights, probably more than I had given credit for, hot seat sharing, modelling what about incidental talk in the sand? When told to talk they are quiet,
Potentially more than one answer, smaller – bigger, ambiguities, unlearing, key is the task,

Causality a good base for talk, uncertainty

School 4
Lots of little investigations, relationships between things –CHANGE,
Mixed ability – at first one took control, now more balanced,
Some children have shared experience, kindness in small groups, frustration,
That was really good it has change the way we will do our maths – mixed ability, Now talking to year 1, what the children are now used to in maths, Little investigations into the maths lesson, not

Our own perceptions of what the children can do are challenged..
Help them to express

Key statements at the end of the day.
Hand it over to the children
Put mathematics learning into a context that is motivational, fun, productive and purposeful
Give it a purpose. Ability to talk needs to be rehearsed.
Engage in meaningful conversation rather than instruction. Put self on the level with the children. Be expressing the – what can we learn together
Talking is evidence of a level of thinking,
The task is the medium
Children's talk is evidencing the level of their thinking
Talking develops mathematical thinking
We need to change our perception of the capability of children

Item 13
Comment from the trainee in School 4 during interview
One afternoon a parent came up to me in the playground and said that her son before school had told his mother that he was so excited to be doing the maths that day. She said that it was really nice to hear this as he usually only mentions after school clubs such as football and basketball, but he was telling her all about his in school maths work.

Account from trainee in School 3 reported here

It was interesting to observe the engagement of one child in an activity 'designing a waistcoat for a teddy bear'. Each waistcoat was to have 5 buttons and each child had a set of buttons allocated to them. This was the question

How many waistcoats could you make with the buttons that you have got?

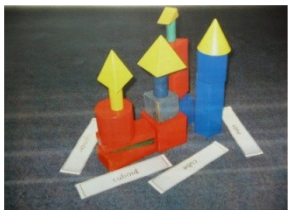
The child in question speaks Polish as his first language and has struggled to accomplish any written recording in mathematics. He was known to be able to count up only to 7. He was very animated by this task. During the session he was heard counting up to fifteen and beyond. He had 22 buttons. He answered that he could make 5 waistcoats with his buttons.

Then he corrected himself and said he could make 6 as he had some extras.

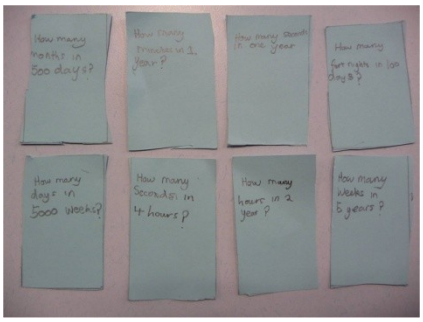
This episode evidenced a significantly higher engagement in maths than had been witnessed previously.

The next day his mother reported her pleasure that he had been talking at home in such an excited way about the maths project. He had never spoken about maths before.

Item 14


Item 15



Item 16

Scaffolding Talk

- **Child 2**: What is a pentagonal prism?
- **Child 3**: It is like a cylinder but with edges. It looks like this. (Shows example of pentagonal prism)
- **Child 2**: Oh okay I think that it will be good.

Item 17

Key points of reflection at interim evaluation stage

School One: Reception

Topic: Castles ... Change

The teacher and trainee reported again on the high quality talk that resulted from the activity of '**constructing castles'** – both in the inside and outside environments, with recycled materials, with large and small fabricated solid shapes. It was noted that the children's talk became high quality talk as they represented, often through narrative, their understanding of the spatial relationships within the structures that they were creating and imagining. Thus high quality talk was not just about learning the names of the 3D shapes, though they of course engaged with this. One form of high quality talk (discursive, narrative, directional) supported another form of high quality talk (distinguishing, identifying, naming) and vice versa

The teacher and trainee reported that they had undertaken lots of little investigations.
The project **'Change'** is helping the children to see the **relationships** between things, for example through **sequencing** pictures of the lives of human beings, approximating ages and putting these numbers in order, developing rationales for their chosen sequence. For example a pregnant woman is judged to be younger than a baby of 0 years as 'the baby is not born yet'. Pictures of older people in the sequence generated discussions of **larger numbers up to 80**

The teacher is enthusiastic about mixed ability groupings.
'*At first one or two children took control but later it got more balanced. Some children have shared experience and show kindness to each other in small groups. The more able do support the less able. There is less frustration when the emphasis is on what they can communicate through talk. It has been really good. It has changed the way we will do our maths – we will now introduce more mixed ability grouping. We are now talking to year 1 about what the Reception children are now used to in maths. A key point is that we are doing little investigations into the maths lesson, not large scale investigations that are too difficult to bring to a conclusion.'*

The trainee commented
'*Our own perceptions of what the children can do are challenged... The open ended activities are helping them to express themselves'*

Item 18

Key points of reflection at interim evaluation stage

School Two: Year 3
Topic: Time Games

Planning
The key ideas for the activities came to the trainee and the teacher **on the way back** from the joint planning meeting. The school is 45 minutes away from the University!

The objectives for the maths session are decided on a daily basis. The maths challenges are therefore kept manageable.

The focus has been maintained through the central task – **the creation of a board game that poses a series of questions about 'Time'**. Communication skills and process skills are a key focus. While the teacher is practising adopting the role of facilitator, the children are

practising and using the skills of brainstorming, developing mathematical vocabulary, sharing reflections, formulating mathematical questions, collaboratively developing methods for answering the questions posed on the games of other groups.

Practical steps to support the discussions in the group work.
The children are allocated roles within the group – chair of the discussions, reporter of the outcomes of the outcomes of the discussion, resource manager who lists the materials they will need, etc. The main language tasks are formulating the questions about time and devising teh instructions for the Time Game.
The teachers (trainee and teacher together) are not allowed to say anything – only to give guidance through messages on postscripts which have to be interpreted by the children. A silent way of supporting discussion. **In this way the dialogue is owned by the children.**

Challenges

1) **A pedagogical question**

Some groups are asking more simple questions, e.g 'How many days in 2 weeks?'
Others are asking more complex questions 'If H is 12 how old will he be in 32 years time?'
Others are asking very hard questions indeed! 'How many seconds in 4 hours?' etc

Is it possible that children can sustain interest better with hard questions that have been posed by their peers?

2) **An organisational challenge**

All the groups are mixed ability and benefits are coming from this. However it is noted that the ability level of one group is lower overall. This group is needing more intervention and support.

Item 19

Key points of reflection at interim evaluation stage

School Three: Year 1
Topic: Measuring – Designing Teddy Bears' Jackets

Initially the trainee and teacher had adapted the 'Giant Hand' activity, using the stimulus of the story to promote children's interest in non-standard measurements.

Developing communication skills
A key issue at this stage was whether the children may first have to develop their communication skills – talking and listening to each other - or whether these skills are best developed during the mathematics activity itself. It was noted that the use of 'talking partners' was in place but that this group of children tended to be very quiet when encouraged to talk!

The sharing of the reflections on children's use of mathematical talk during the Castle activities in School 1 helped to resolve this issue as the trainee and teacher recognised that there had been far more high quality talk in their own classroom than they had previously thought.

A key challenge that was addressed through this discussion related to the nature of **high quality talk**. It was understood that high quality talk in mathematics is less about the

expression through language of perfectly formed mathematical ideas and more about the **practice of mathematical reasoning skills**. This realisation made the task much less daunting.

In this way it was understood that the communication skills were best developed during an appropriate challenge that promoted high quality talk. Some ideas that were shared about how to recognise high quality talk in this context (Y1) included

- Noticing children's incidental talk while engaged in a practical activities
- Children's capacity to make comparisons and justify judgements, for example about relative sizes
- Noticing children's responses to questions to which there is not a single answer, documenting their engagement with ambiguities and uncertainties (mysteries)
- Children's capacity to discuss what might have caused something to happen

Item 20

Key points of reflection at interim evaluation stage

School Four: Year 3/4
Topic: Mini challenges – designing packaging

It was noted at this interim stage that a series of **mini-challenges** had stimulated the children to engage in mathematical investigations independently. They worked in small mixed ability groups. They evidenced a capacity to sustain their interest and support each other through a discursive and interactive process. It was noted that the tasks themselves were medium through which the children's high quality talk was achieved. The tasks were negotiated through discussion between the teacher and the trainee, really by way of testing the soundness of the basic tenet of the project- that talk for learning was something to be further investigated with respect to mathematics teaching.

The **tasks** they devised are listed here

- Do children with big hands have big feet?
- Are girls taller than boys?
- Which group can throw the bean bag the furthest?
- Which group is fastest over 10m?

The trainee said

'With the task 'Do children with big hands have big feet?' they were talking about how to measure their hands – where to start on their hands and where to start with the ruler. They were talking about whether the results that they had put in a table were true or not. 2 of them found it was and other groups found it was not the case. They kind of disproved each other. It became a 'Let's find out kind of thing. One girl said 'I can't believe we are doing maths'. Another said afterwards – ' I really enjoyed it because it was educational as well as being fun'. They got to go outside. They were excited by it the next day when they had another question.

With the task about whether boys are taller than girls – we actually had some tall girls and they were talking about whether this would be true in other classes. After the measuring

skills – they got into this kind of conversation. They were discussing in a way that indicated that they knew they needed to do a bigger survey, to draw on a bigger sample to make it more valid'.

The teacher and trainee commented together

'It has come as a surprise to hear them talking like this. This really makes us think about the teacher's role in questioning'.

The trainee said 'I have taken some risks – but it has transformed my teaching. This school has been amazing – I have felt so confident because the teacher is so involved alongside me. The University has always promoted learning through talk in mathematics and I have now learned how to put it into practice. I will continue to try to promote high quality talk in mathematics'.

Emerging issue
There is an ongoing question within the project about whether this form of educational practice really involves **risk taking** or whether it is a basic entitlement that children should have access to in their everyday learning environment.

Item 21

Activity for all school based mentors working with Primary PGCE trainees in May 2010

What are the key professional development needs of your trainee(s)?

Following the input on session on **promoting high quality talk in mathematics in ITT**, what (shared?) focus might you introduce / negotiate to support your trainee in making best progress against the standards?

Suggestions from School Based Mentors during the training session

1) Take responsibility for planning for week after half term – freedom to be creative supporting active, independent learning and talking of children
2) Supporting team talking – practical / problem solving – an investigation using some resources – Promoting high quality talk
3) Assessment – use a book with post-its stickers focussing on the child's talk. Noticing children's different oral contributions
4) Talking partners – encouraging open questions
5) 3 students work together planning investigations – including communicating with the parents – plan, resource, homework, celebration at end of week – focus language for learning
6) Encourage student to put a risk element in each lesson – encouraging children themselves to talk more.
7) Encouraging open ended questions – and focus on timings – not on carpet too long. Include some hand over to the learners (children)
8) Opportunity to take risks e.g. using different artefacts to support discussion / learning
9) Thinking about groupings of children to support progress across ability range
10) **Develop a learning project together – children, trainee and teacher**

Item 22

Timeline for the ITT Leading Partnership in Mathematics Pilot Project: UWE / NS. Promoting high quality talk in mathematics through effective guided group work with mixed ability groups

Monday January 18: Confirming project milestones
Consultation between UWE mathematics team and Alice Hansen and David Waugh (Regional Director National Strategies)

Wednesday 27 January PM: Development of Training and Assessment
(Director of ITT, UWE maths team, with class teachers and trainees: supply cover)

- Supporting the development of teaching sessions which promote high quality talk.
- Identifying criteria to support observations and feedback to trainees

Wb Monday February 1: Practice of activities
(Class teachers with trainees in schools / settings)

- Trial of activities to promote high quality talk in mathematics sessions.
- Trial of use of criteria for observation and feedback to trainees

Monday February 8 PM: Review / further development of training and assessment
(Director of ITT, UWE maths team, class teachers and trainees)
Sharing practice of activities. Sharing outcomes from observation and feedback

- Support for plans to evaluate impact on children's learning and trainees' capacity to teach mathematics

Friday February 12 AM: Interim dissemination through mentor training
(Director of Partnership, class teachers, UWE maths team representative)

- Contributions to discussions for all school-based trainers working with UGP3 trainees including draft guidance on providing feedback related to high quality talk in mathematics

Monday 22 February – Friday 12 March
(Class teachers, UWE maths team)

- Continuing activities to promote high quality talk in mathematics lessons
- Weekly feedback to trainees (3 observations)
- Reciprocal visits by class teachers to partner school for joint observation (supply cover)
- Support for developing video material of selected teaching sessions

Friday 12 March PM session. Supporting the evaluation process
(Director of ITT, UWE maths team, class teachers, trainees)

- Sharing outcomes from observation and feedback. Sharing case studies and school documentation
- Making recommendations for further development of ideas to promote high quality talk in mathematics
- Further consultation about subsequent contributions to centre-based training
- Preliminary documentation of outcomes to support the preparation of the report

Wb 22 March. Evaluation

(Link Tutors, class teachers, trainees)

- Independent consultation between link tutors, class teachers and trainees to evaluate the impact on the activities on children's learning and trainees' capacity to teach mathematics
- Reports submitted to Director ITT

Wb 29 March. Preparation of report
(Director of ITT with support from UWE maths team)

- Report submitted on 31st March including recommendations for enhancing the cohesion between school-based and centre-based training, initially to be disseminated at the practice specific training for the final PG programme on May 12.

Item 23

Trainee in School 4

I am now graded 'outstanding' in 'professional knowledge and understanding' and 'professional skills' which had previously been 'good'. I think this was a result from the project. There was something I had to do with my teacher. I did not feel I was getting in the way as we were doing it together.