Brunel University London

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Department for Education

Enhancing Mathematical Learning through Talk at Key Stage 1

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Aims

The project aimed to develop two interacting strands

1) Subject Knowledge

2) Teaching expertise of teachers

… through the collaborative study of spoken language and talk-in-interaction about mathematical concepts. The central theme focussed on the role that the discussion played in generating enthusiasm and spirit of enquiry, both in teachers and children.

Why Key Stage 1?

1) Shortage of well-designed, evidence-based professional development to support KS1 teachers in their teaching of mathematics.

2) The importance of laying solid foundations in the first years of schooling - when attitudes are formed and gaps in knowledge will affect future learning and progression in mathematics.

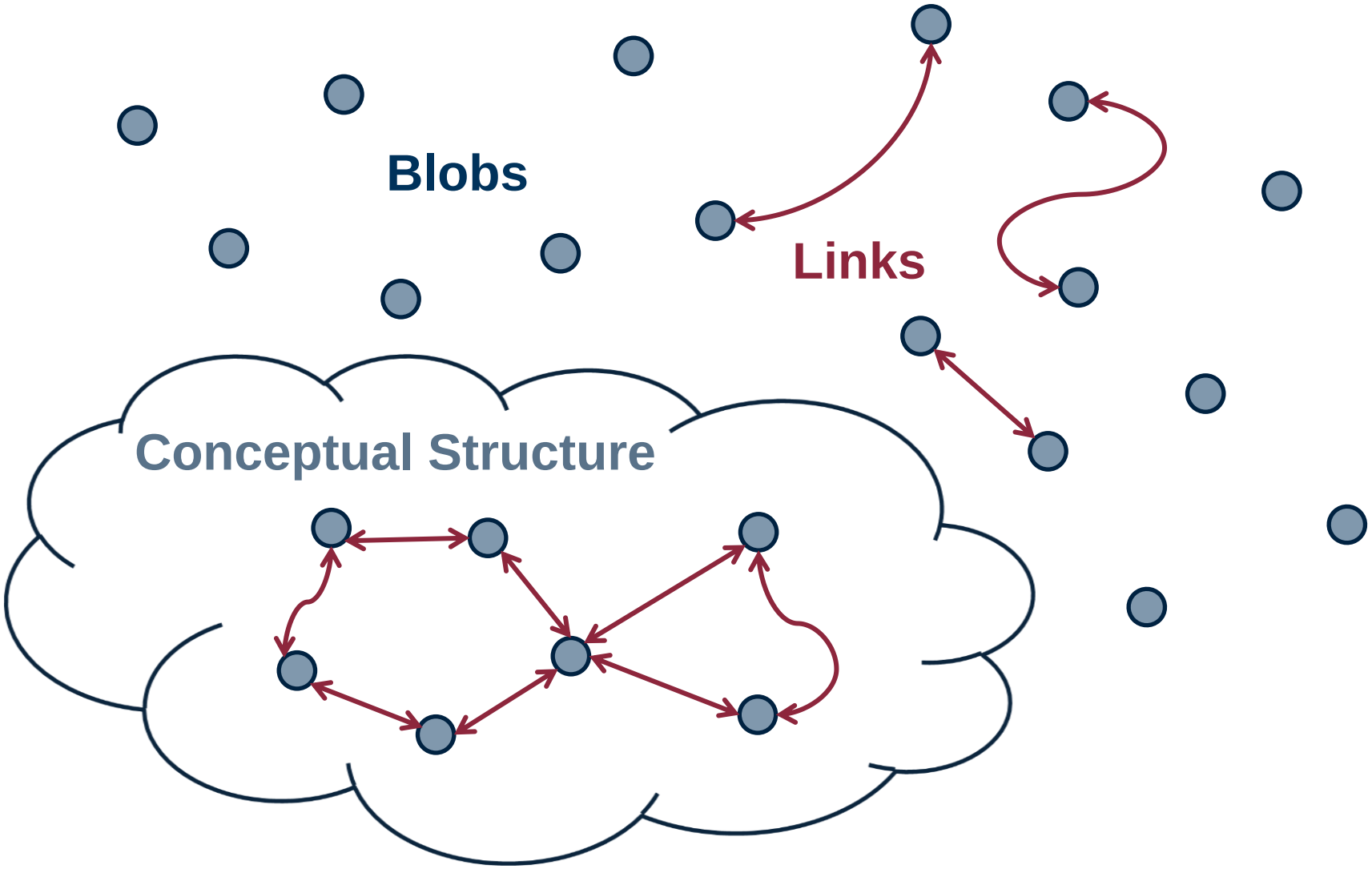
3) Many children do not have opportunities for ‘Maths talk’ at home for various reasons.

A rationale for using ‘maths talk’ to enhance learning

***Neuroscience** : Talk is necessary not just for learning, but also for the building of the brain itself as a physical organism, thereby expanding its power. If, as has long been known, the first years of life - and the primary phase of schooling, more or less - are years in which the brain in effect restructures itself (building cells, making new fibre connections between cells and pruning old ones), developing the capacity for learning, memory, emotional response and language are on a scale which decreases markedly thereafter. So talking actively and vigorously fuels these processes.*

Robin Alexander (2008)

“Blobs and Links” in Conceptual Understanding



Adapted from ATM (2004): ‘*Mathematics Teaching’, Issue 189*

Objectives of Mathematics Teaching

Effective mathematics teaching should pay attention to all of the following:

- **Facts**
- **Skills**
- **Conceptual structures**
- **General strategies**
- **Attitudes to mathematics**
- **Appreciation of mathematics**

… as detailed on the slides which follow.

Cockcroft Report (1982), HMI (1976), Koshy (1999; 2000)

(1) Facts

Description…	Practical ways to support …
Facts represent the basic 'atoms' of mathematical knowledge, e.g. terminology and symbols, with each one being a small and elementary piece of knowledge.	Discussion of terms and symbols in small groups and with the whole class. Keeping 'fact books' and personalised 'glossaries'. The words and names (blobs) become part of the child's conceptual structures in time.

(2) Skills

Description..	Practical ways to support…
Skills are well-defined multi-step procedures, including commonly used skills such as basic number operations. Skills are most often learned with understanding through discussions, explanations and examples.	Procedures and methodology. Group discussions and conferences on strategies used and analysed. Discuss ‘error’ patterns. Use pretend childrens’ mistakes and seek explanations using ‘Can you explain why...’ as a strategy.

(3) Conceptual Structures

Description…	Practical ways to support…
Conceptual structures consist of a set of concepts and their inter relationships. Discussions and explanations are necessary to help the learner to develop a robust conceptual structure.	Focus on explanations during practical tasks supporting formalisation. Create *cognitive conflict* with class activities including "I agree" & "I disagree" statements, structured games, and modifying closed lesson plans to generate discussions.

(4) General Strategies

Description…	Practical ways to support…
General strategies are a range of problem-solving activities to develop processes of reasoning, conjecturing and communicating.	Problem-solving activities based on both 'pure' and 'real-life' mathematics. Develop problem-solving processes of reasoning, conjecturing and communicating. 'Personal' and/or group diaries completed when appropriate (after discussions). Encourage children to record own methods using words and diagrams.

(5) Attitudes to Mathematics

Description…	Practical ways to support…
Attitudes involve the learner's feelings and responses. They cannot be directly taught, and are the indirect outcome of a student's learning experiences. Teachers play a crucial role in helping students to build a positive attitude towards mathematics.	Adopt an interactive teaching procedure. Make mathematics have relevance to real-life by using home-based tasks also involving parents. Structured games. Mathematics from existing stories and construction of new 'group' mathematical stories.

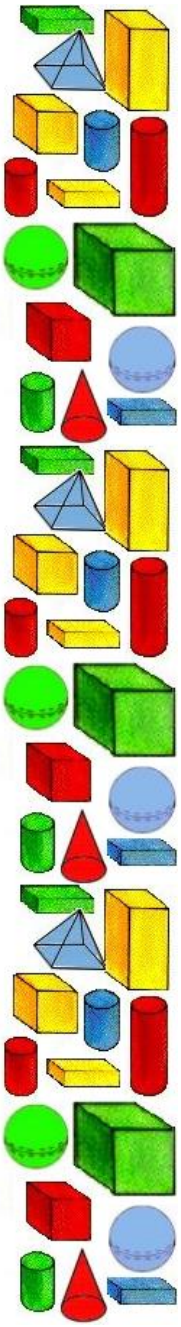
(6) Appreciation

Description…	Practical ways to support…
Appreciation is the awareness of the role of mathematics in everyday life.	Awareness of mathematics is encouraged through problem solving and connecting it to other school subjects. Mathematics from stories.

Development of Subject Knowledge

- Audits, self-assessment, target setting and pre- & post- gathering of scores
- Subject Knowledge Support Hubs
- Books and Resources
- Glossaries
- Subject Knowledge Modules
- Special Surgeries


Painting
£5
£1
£10
£2
Colours used
Cost of paint
Ground rent
My house has 2 faces touching the gro
The ground rent for my house is



Topics Covered

- Shape, space and measures
- Handling Data
- Calculating:
  - Fractions
  - Decimals
  - Percentages
  - Ratio
  - Proportional Reasoning
- Algebra

What have we achieved from the subject knowledge development strand ?

- 20% average increase in total score from the pre- to post- audit, carried out by teachers
- 21% more teachers (average) felt more confident in teaching pupils various topics in Mathematics
- Better understanding of concepts , progression and inter-connections and relationships .

Final Reflections

Teacher:

"Obtaining subject knowledge of specific areas before teaching the topic has given me more confidence. I felt better prepared for explanations and discussions, linking/building the children's understanding, and learning about 'joining all the blobs' as Valsa would say!"

Child:

"I have been teaching mum to speak maths. She could only speak Polish before."

Thank you