Primary Mathematics: Curriculum and beyond

Amitabha Mukherjee
Department of Physics and Astrophysics
University of Delhi
Delhi 110007, INDIA

For the Indian National Presentation at
International Congress on Mathematical Education,
Seoul, Korea, July 2012

A lightning overview

- Primary mathematics curricula and textbooks in India are undergoing a process of change
- The National Curriculum Framework 2005 is a major element in this process
- Broadly, we can talk of a ‘traditional’ approach and a ‘new’ one

Some key points

- Mathematics is not just Number and Number Operations. It includes Shapes and Space, Measurement, Data Handling and Patterns
- Children are not blank slates when they enter school; their prior knowledge should be built upon
- Learning is not a linear process; mathematics materials should be designed to incorporate looping, spiralling, horizontal elaboration

Numbers

- Traditionally
  - No effort to locate in children's experience
  - No emphasis on number sense
  - Estimation absent
- New ideas
  - Develop number sense through concrete experience in the early grades
  - Incorporate estimation

Number Operations

- Traditional treatment:
  - Linear presentation
  - Great emphasis on algorithms
  - No acknowledgement of alternate ways of calculating
- Change:
  - Defer standard algorithms
  - Encourage oral and non-standard ways of calculating
  - There is no 'one correct way'

Fractions

- A major problem area
- “How much is 11/35 + 23/49?”
- Children were (are) made to do many such sums, using a set of rules, apparently arbitrary

- We don’t have to do this!
- Most of the work on fractions can be postponed to middle school

Shapes and Space

- Traditionally given too little space (!)
  - children's ideas on shapes ignored,
  - emphasis on regular figures;
  - spatial relationships largely ignored;
- New ideas
  - Give more curricular space
  - Build on children's ideas on shapes (e.g. what is long, what is round)
  - Explore spatial relationships
  - Include perspective, maps

Measurement

- Traditionally:
  - Often reduced to arithmetic with units (e.g. what is 5 m 53 cm + 7 m 82 cm?)
  - Non-standard units treated in a token manner
- What's new:
  - Use variety of units
  - Relate to physical act of measuring

Data Handling

- Traditionally, data handling was regarded as “too difficult” for small children

- New ideas:
  - Can be started right from Grade 1
  - Many meaningful activities of collecting, presenting and analysing data are possible

Patterns

- Traditionally, not recognised as a domain of mathematics
- Current view: needs to be addressed explicitly
  - May ease the entry into algebra

Facilitators of Change

Some organisations/programmes that have contributed to the changes

Eklavya (in Madhya Pradesh); Suvidya (in Karnataka); School Mathematics Project (in Delhi); Tamil Nadu Science Forum; Indira Gandhi National Open University; Govt of Kerala (through DPEP); Homi Bhabha Centre for Science Education (Mumbai); SCERT Delhi

→Culminating in NCF 2005

Challenges

- The process of change represented by NCF 2005 is an ongoing one
- Mindsets don’t change so fast – “mathematics is not for everybody”
- Teachers need support – pre-service education, in-service programmes, networks, e-enabled support
- The task is formidable but not impossible

Thank you!