Primary Mathematics Study on Whole Numbers

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PANEL ON TRADITION: INTRODUCTION

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1. Tradition and whole numbers

The way whole numbers are thought, represented, spoken, written, taught, and learnt sums up in what we can address as (part of) tradition.

2. Different components and viewpoints

Researchers and teachers should consider them under many different instances and perspectives and components:

- **cultural**
- **epistemological**
- **psychological**
- **neurological**

and particularly under the lens of **cross-cultural contacts:** transmission, reception, invention, interaction and communication (N. Standaert).

3. An antinomy: universal Vs particular?

Some of these components have a more or less strong **particular** connotation, linked as they are to the different cultures and traditions.

Others are more general and seem to have universal traits.

The so-called **Near-Universal Conventional mathematics** may appear in more or less deep conflicts with such particular aspects.

3. An antinomy: universal Vs particular?

This possible contrast can indeed represent a main problem for teachers: a reasonable learning trajectory for whole numbers from the one side cannot avoid their **traditional roots**, but from the other side its main goal must address the **NUC**.

4. Aims of the Panel:

- **deepening the analysis** of some of these different roots, considering old and new findings from research and practice;

- making explicit the main consequences for possible **concrete didactical trajectories**.

Main themes

- Different cultural approaches to numbers
- Different semiotic representations of numbers, which embody different cultural roots
- Different tools that support counting
- Possible learning trajectories

5. Main themes

- Different semiotic representations of numbers, which embody different cultural roots (e.g. verbal Vs non verbal representations)
- Different tools that support counting
- Possible learning trajectories: Universal Vs Particular

Different semiotic representations of numbers

a) *Numbers and words.*

Cross cultural issues:
- *In the way numbers are said/written* (N. Azrou)

- Possible learning trajectories with a "metissage" between different representations coming from different cultures: an example (China+Italy)

Different semiotic representations of numbers

b. Non-verbal representations of numbers.
- multi-steps processes while intertwining language and gestures (Vergnaud, Butterworth-Reed)
- word counting strategies are not the only ones that people can use for developing arithmetic competencies (Butterworth,Reeve & Reynolds; Monti, Parsons & Osherson)
- continuous, analogic system Vs discrete ones (Gallistel & Gelman)

Representing numbers in artefacts

Old and new, West and East:
- Number line Vs Suanpan; magnitudes vs numbers; Du Vs Shu (Bartolini, Sun Xuhua)
- Emulation of old tools in new environments (Pascal Machine: Maschietto & Soury-Lauvergne)
- Fingers on tablets and counting processes (Sinclair)

QUESTIONS for the PANEL

- How teachers can concretely base their task design for arithmetic on the linguistic and cultural roots of numbers?
- Is the embodied traditional approach to arithmetic, to be modified/extended by the findings of neurological researches on numbers?
- How the traditional instances are embodied in nowadays technology?
- Does the possible integration of cultural roots within the technological environments allow to bridge the gap between the "old fashioned" tradition and the NUC?