

Does “dyscalculia” depend on initial primary school instruction?

Anna Baccaglini-Frank

Sapienza University of Rome (Italy)

(formerly) University of Modena and Reggio Emilia

A research question

Can

appropriate mathematical exposure

reduce the percentage of

dyscalculic students

(in Italy)?



Defining DD is challenging...
A constraint on the depth of our knowledge in this area stems from the **paucity of research on DD**, particularly relative to research on other learning disorders... A related obstacle is the **lack of universal classification criteria for DD**, leading to inconsistent composition of DD samples across studies... Until recently, **assessment-based cut-off scores used to define DD samples were also highly variable.**

Mazzocco (2005), Mazzocco & Räsänen (2013)

In Italy D.D. is diagnosed through

the AC-MT battery:

Cornoldi, C., Lucangeli, D. & Bellina, M. (2012).

Test AC-MT 6-11 – Test di Valutazione delle abilità di calcolo e soluzione di problemi. Trento: Erickson.

This can be administered in 3rd Grade.

The PerContare project

One of the objectives of the 3-year project was to develop didactical material giving “appropriate mathematical exposure” to all children in 1st and 2nd Grade, to help prevent the development of persistent difficulties in mathematics (in particular, arithmetic).

The materials were developed under the supervision of M.G. Bartolini Bussi (math educator), in collaboration with G. Stella (psychologist).

Theoretical foundation of the “appropriate mathematical exposure”

(A subset of the) key elements chosen from literature in mathematics education and psychology includes:

- development of “number sense”;
- use of physical and digital artefacts (within the theory of semiotic mediation).

Key elements for the development of “number sense”

“Number sense reputedly constitutes an awareness, intuition, recognition, knowledge, skill, ability, desire, feel, expectation, process, conceptual structure, or mental number line.”

(Berch, 2005, p. 333)

Key elements for the development of “number sense”

- **strengthening of component abilities of “number sense”** including subitizing and finger gnosis (Butterworth, 1999; Gracia-Baffaluy & Noël 2008; Baccaglini-Frank & Maracci, 2015);
- **awareness of part-whole relationships** (Resnick et al., 1991; Schmittau, 2011);
- **awareness of pattern and structure** (Mulligan & Mitchelmore, 2013).

Artefacts in PerContare

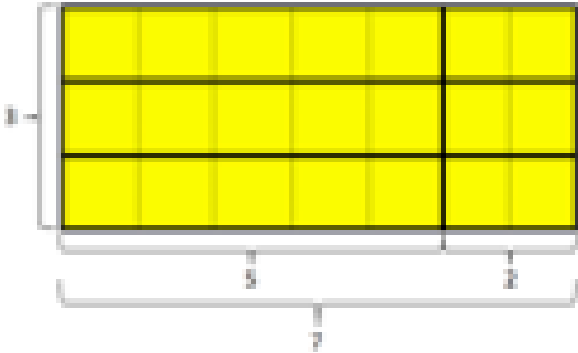
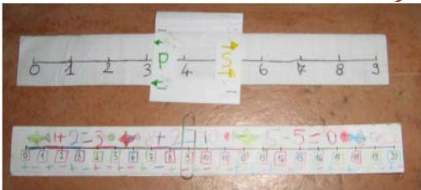
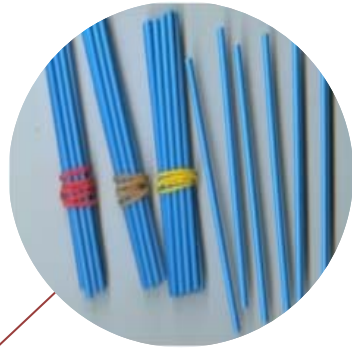
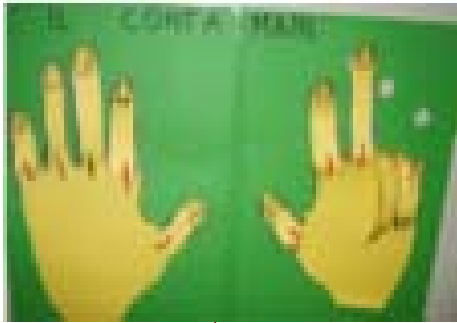


Table of Contents:

INDICE GRAFICO DEI PERCORSI

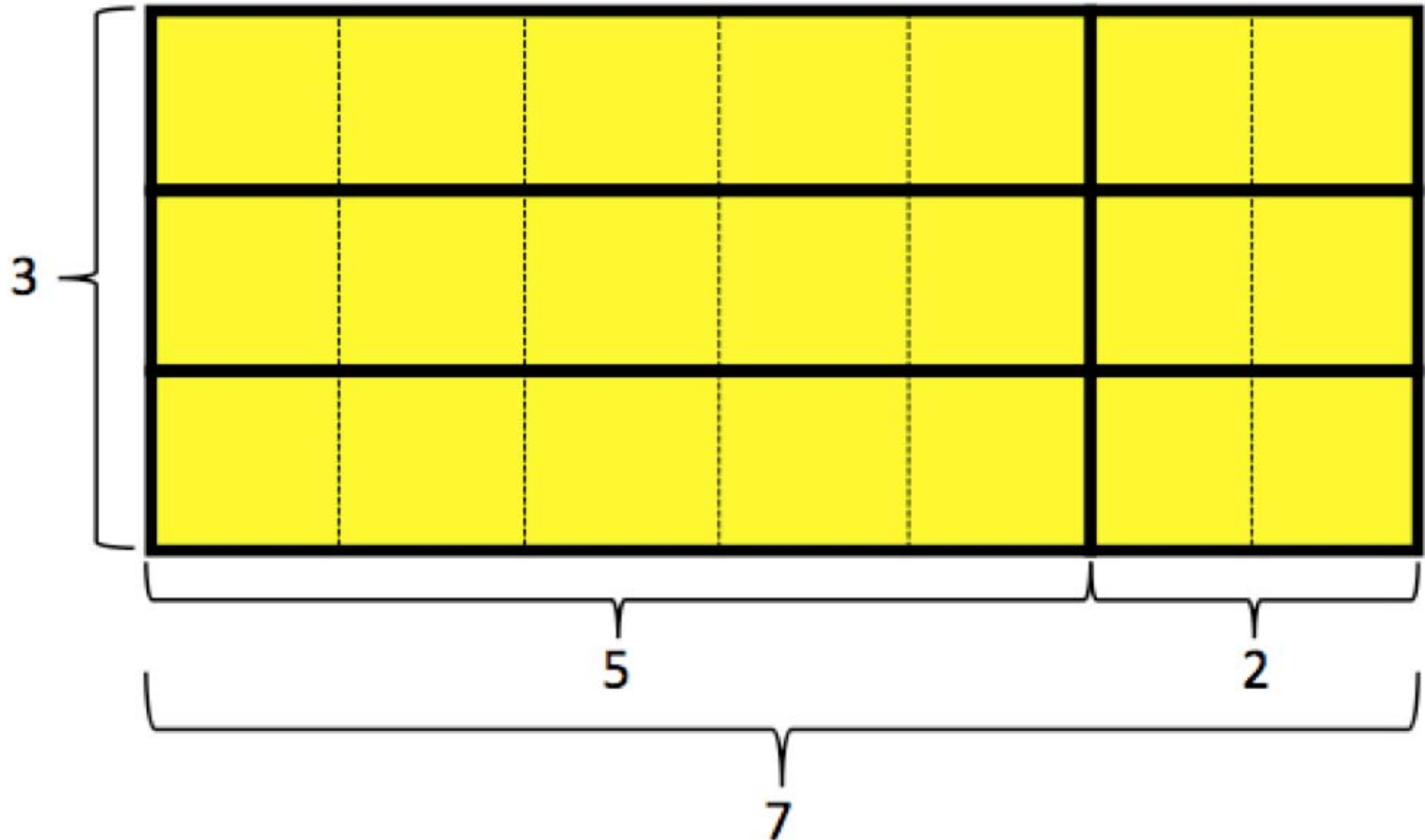
BUONE ABITUDINI				
PROBLEMI CON VARIAZIONE		PRIME ATTIVITA'		
COMPLEMENTARITÀ DEI NUMERI	COMPLEMENTARIETA' DEI NUMERI			
	Introduzione numeri 1-9			
	I numeri con le mani			
	I numeri con contamani			
	Complementarietà gioco			
	Introduzione scomposizioni			
	Scomposizioni i numeri 1-9			
	Introduzione 10			
	Gioco per la decina			
	Introduzione 10 con linea num.			
	Rappresentaz. Numeri con mani			
	Giocchi mani e contamani			
	Relazione complementarietà			
	Linea num. finestra scorrevole			
	Confrontare i numeri			
	Bee-bot e linea numeri			
	Gioco con pascalina			
	AZIONE DECIMALE POSIZIONALE			
	Introduzione 10			
	Gioco per la decina			
	Introduz. 10 con linea num.			
	Rappres. numeri cannuce			
	Confronto numeri			
	Cannuce e scatole trasp.			
	Scopriamo pascalina			
	Approfondiamo pascalina			
	Gioco pascalina			
			AVVIO AL CALCOLO	
	Giocchi mani e contamani			
	Gioco intro segno +			
	Gioco intro segno -			
	Avanti-indietro linea n			
	Pari e dispari			
	Calcolo a mente			
	Add. e sott. con pascal			
	avoro con abaco o			
	h.abaco			

Table of Contents: Teacher's Guide for 2nd Grade

INDICE GRAFICO DEI PERCORSI

		BUONE ABITUDINI CON GLI STRUMENTI(*)						
		Gioco con la pascalina *	Introduzione abaco o b.abaco	Lavoriamo con abaco o b.abaco	Confronto strumenti			
		<p style="text-align: center;">NUMERI FINO A 100</p>						
	Confronto fra strumenti					Lavoriamo con abaco e b.abaco *	Viaggiando fra i numeri *	Numeri oltre 20 *
	Gioco con la pascalina *							
	Numeri pari e dispari 1					Numeri pari e dispari 2		
		<p style="text-align: center;">CALCOLO</p>						
	Calcolo a mente *							
	Addizione e sottraz. 1							
	Addizione e sottraz. 2							
	Avvio calcolo in colonna							
	Moltiplicaz- diagrammi							
	Da diagrammi a operaz. 1							
	Tavolona pitagorica							
	Posizione tavola pitagorica							
	La simmetria							
	Completare buchi							
	Multiplic: linea e cannuce							
	Operazioni contestualizzate							
		<p style="text-align: center;">MISURA</p>						
	Introduzione r bot							
	Misura quanti							
	Misura quanti							
	Misura quanti							

Use this diagram to figure out the product 7×3 using the products you know (try to avoid counting)







Results of the longitudinal study (Baccaglioni-Frank & Scorza, in preparation)

Percentages of children positive to the AC-MT test in 3rd Grade

Year sample entered project	Experimental Classes	Control Classes
First year (2011)	7%	13% (t student = p>0.05)
Second Year (2012)	(not yet available)	(not yet available)
in calculation (mental and written):	<ul style="list-style-type: none"> • greater variety in strategies used • greater accuracy • no child does not answer • longer time to automatize facts (by about 3 months) 	<ul style="list-style-type: none"> • “standardized” strategies • lower accuracy • various children do not answer various questions

If the percentage of dyscalculics (as diagnosed by standardized tests) significantly depends (among other factors) on students' initial mathematical experiences in school, does it make sense to keep on searching for *who* these children are, instead of investigating *why* some children fail to overcome difficulties in mathematical learning that others overcome?