Does “dyscalculia” depend on initial primary school instruction?

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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”

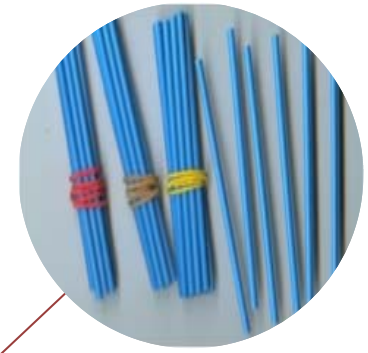
“Number sense reputedly constitutes an awareness, intuition, recognition, knowledge, skill, ability, desire, feel, expectation, process, conceptual structure, or mental number line.”

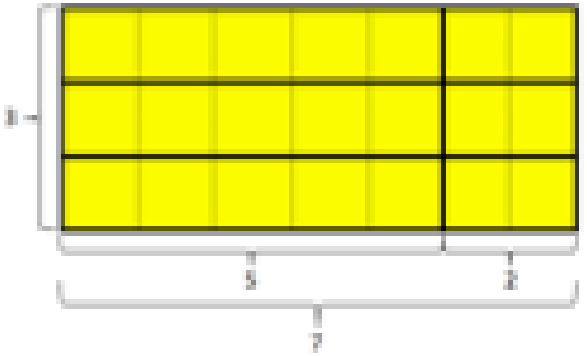
(Berch, 2005, p. 333)

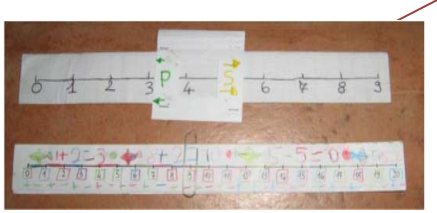
Key elements for the development of “number sense”

- strengthening of component abilities of “number sense” including subitizing and finger gnosia (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







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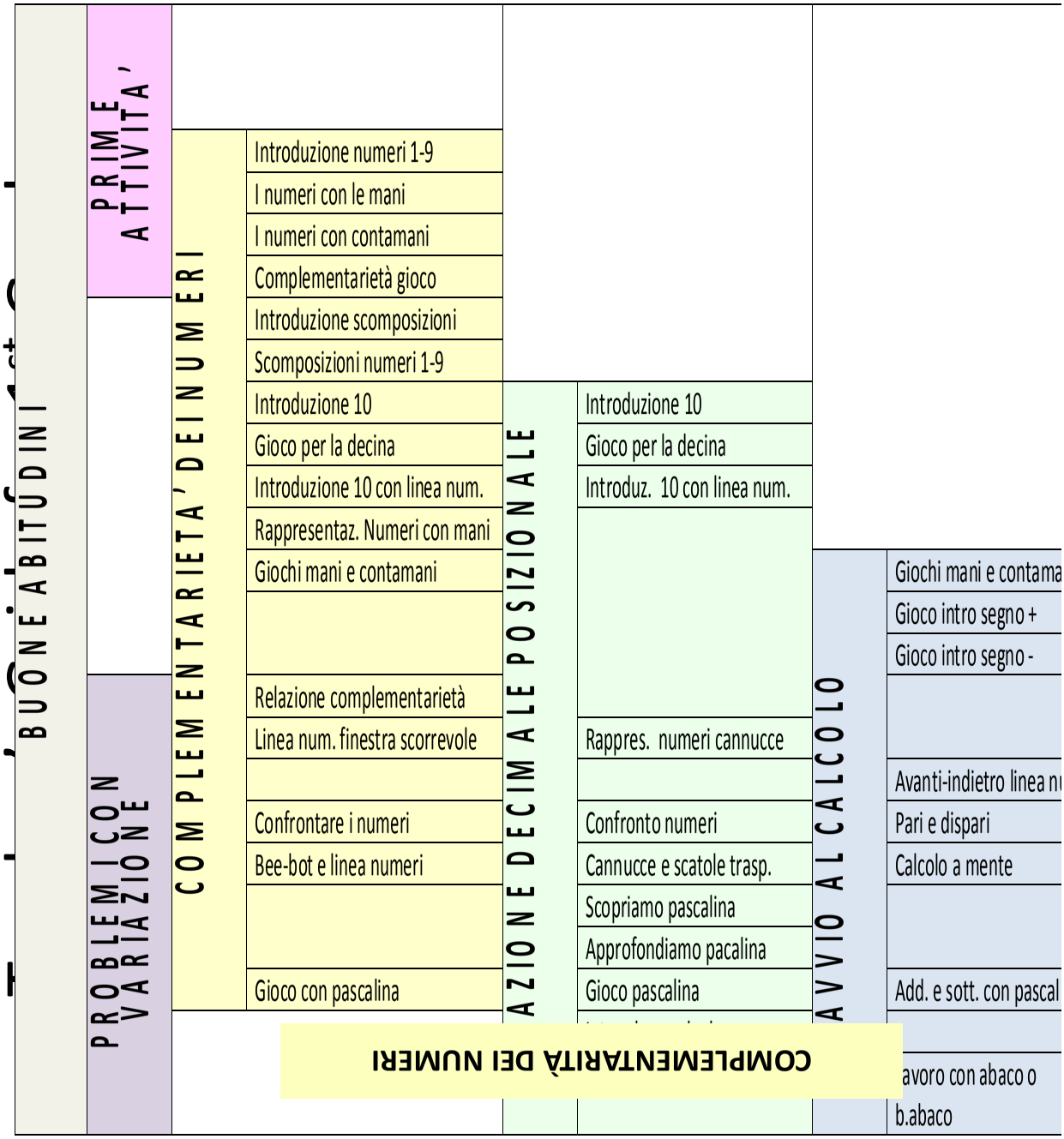

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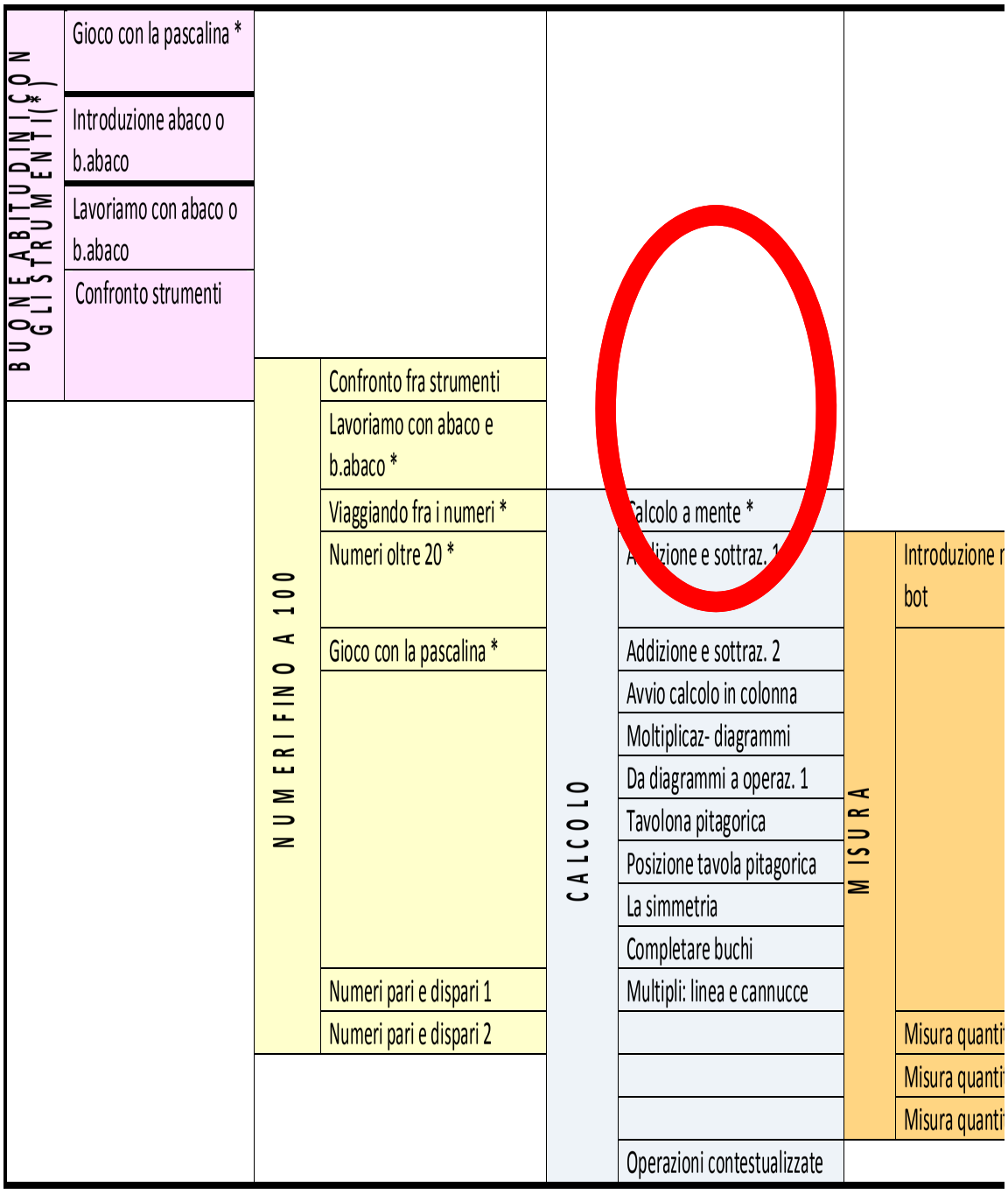
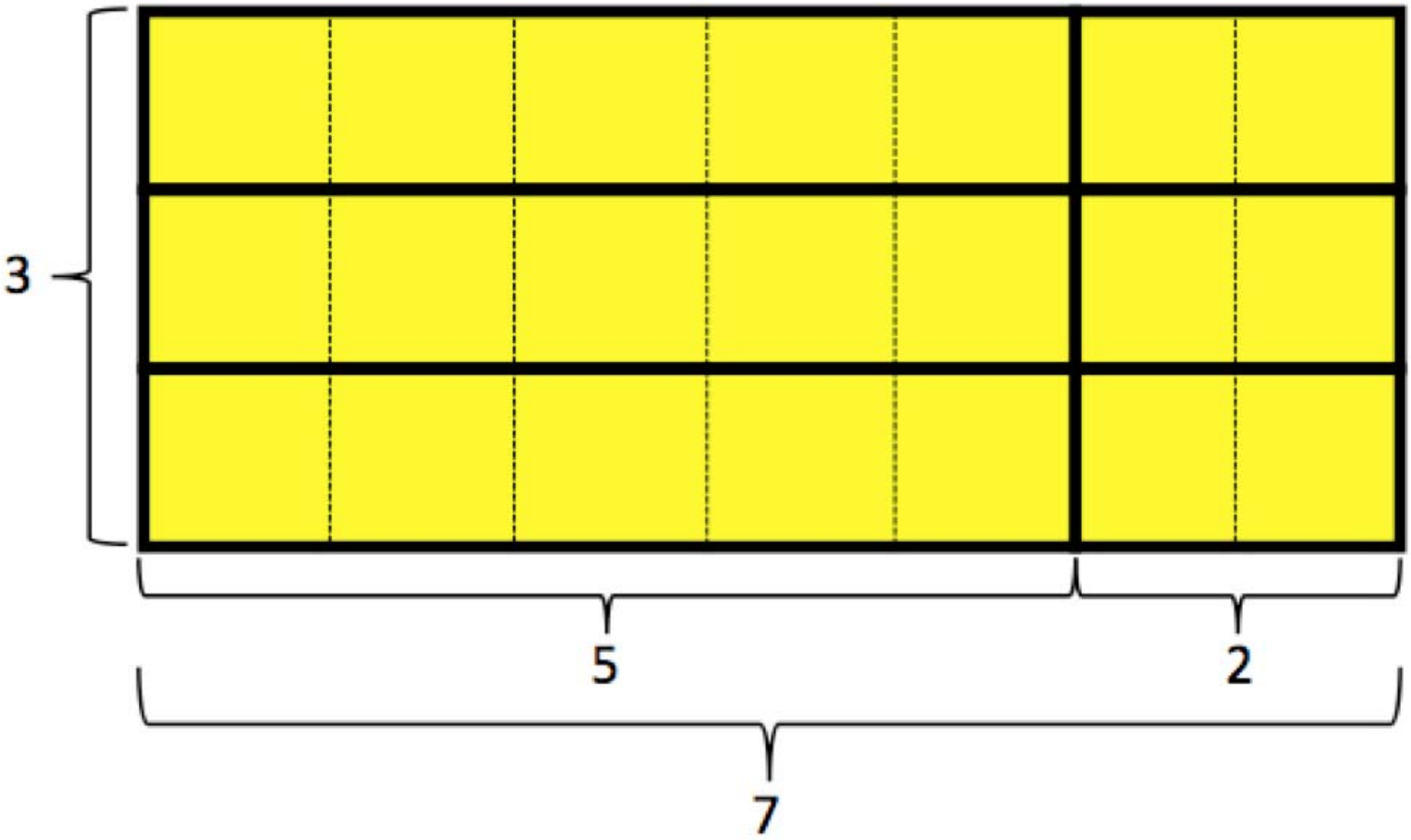


Use this diagram to figure out the product 7x3 using the products you know (try to avoid counting)




8X8
8X6
30
126
Part 4a

Results of the longitudinal study
(Baccaglini-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):	• greater variety in strategies used • greater accuracy • no child does not answer • longer time to automatize facts (by about 3 months)	• "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?