CERME 8

WG 2

TEACHING AND LEARNING OF NUMBER SYSTEMS AND ARITHMETIC

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Scope and focus

- theoretical and empirical research on the teaching and learning of number systems and arithmetic in grades 1 – 12

An emphasis is put on:

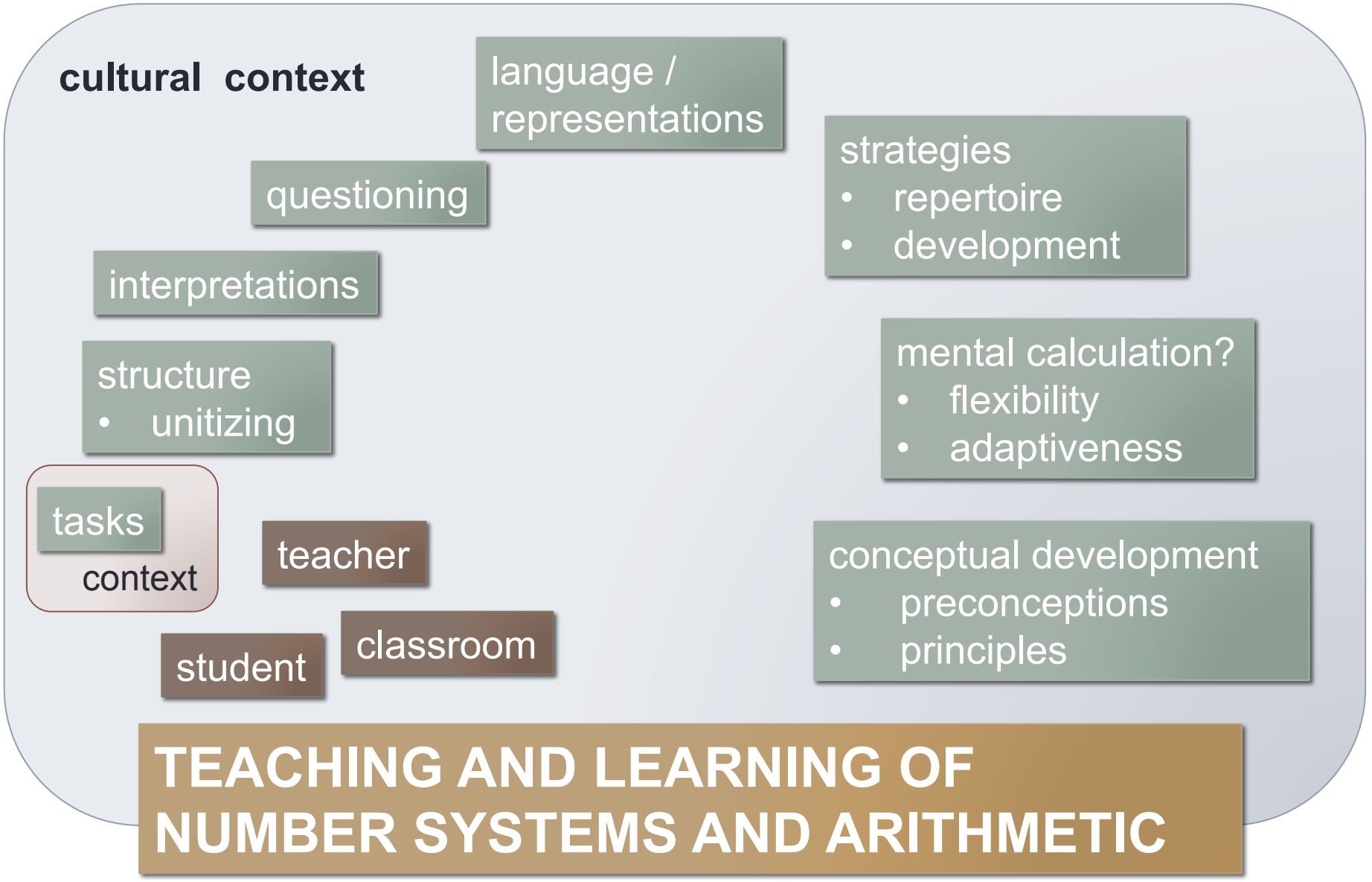
- research-based specifications of domain-specific goals (What should be learned? What can be learned? Which priority is given to particular aspects and why?)
- analysis of learning processes and learning outcomes in domain-specific learning environments and classroom cultures;
- new approaches to the design of meaningful and rich learning environments and assessments

Main questions

- What balance and which interplay between developing conceptual understanding and procedural skills for number operations can and should we aim at while designing learning environments?
- What does it mean to operate flexibly with numbers and what knowledge and skills are required to operate flexibly with numbers?
- What are the roles of models and teaching strategies in operating with numbers flexibly?
- What aspects of number theory should and can be taught in primary and secondary school, and how can these be taught?
- How can long-term learning processes from grade 1 to grade 12 be supported and analysed? How can the different transitions involved, especially the primary-secondary transition, be taken into account?
- What aspects of the number curriculum at the end of the secondary level can support the transition to the tertiary level?

Authors	Title
Catherine Houdement Christine Chambris	Why and how to introduce numbers units in 1st-and 2nd-grades
Isabel Velez João Pedro da Ponte	Representations and reasoning strategies of grade 3 students in problem solving
Uta Häsel-Weide Marcus Nührenbörger	Replacing counting strategies: children's constructs working on number sequences
Cristina Morais Lurdes Serrazina	Mental computation strategies in subtraction problem solving
Elisabeth Rathgeb-Schnierer Michael Green	Flexibility in mental calculation in elementary students from different math classes
Renata Carvalho João Pedro da Ponte	Students' mental computation strategies with rational numbers represented as fractions

Authors	Title
Andreas Lorange Reinert Rinvold	Levels of objectification in students' strategies
Gerald Wittmann	The consistency of students' error patterns in solving computational problems with fractions
Benoît Rittaud Laurent Vivier	Different praxeologies for rational numbers in decimal system – the 0,9 case
Nadine Bednarz Jérome Proulx	The (relativity of the) whole as a fundamental dimension in the conceptualization of fractions
Susanne Prediger	Focussing structural relations in the bar board – a design research study for fostering all students' conceptual understanding of fractions
Bernardo Gomez Javier Monje et al.	Performance on ratio in realistic discount tasks
Maike Schindler Stephan Hußmann	About students' individual concepts of negative Integer – in terms of the order relation


cultural context
language / representations
questioning
strategies
• repertoire
• development
interpretations
mental calculation?
• flexibility
• adaptiveness
structure
• unitizing
tasks
context
teacher
conceptual development
• preconceptions
• principles
student
classroom
TEACHING AND LEARNING OF NUMBER SYSTEMS AND ARITHMETIC
natural numbers
fractions / decimals /ratios
negative numbers

mental calculation

- What characterizes mental calculation?
  - the extent of the use of external representations?
    - calculation is always a cognitive process
    - mental use of standard algorithm?
  - calculation with numbers vs. calculation with digits?

- What does mental calculation mean related to whole and rational numbers?

- How to foster relative thinking related to whole and rational numbers?

similarity of (mathematical) situations?

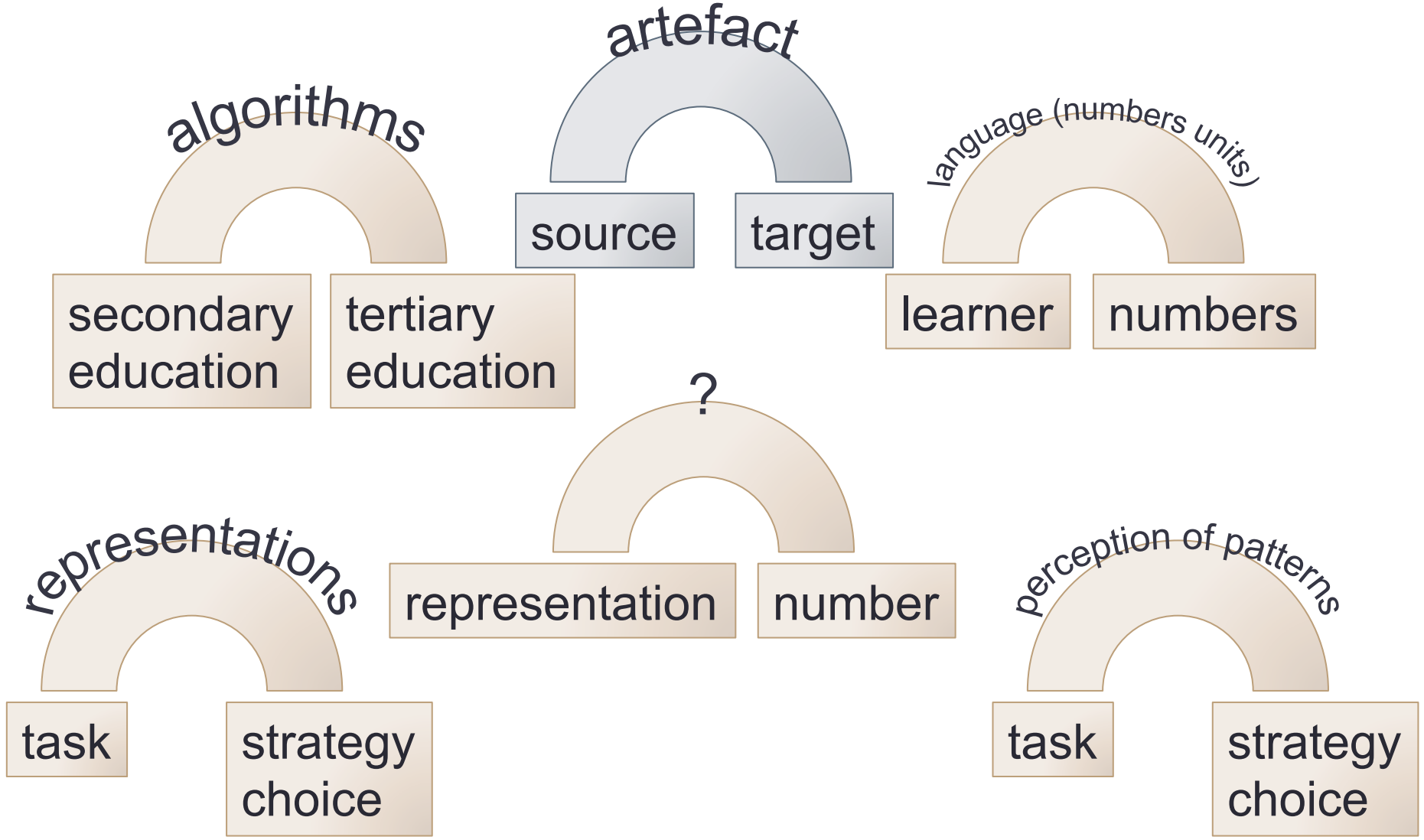
When is a solution pattern / strategy consistent?

When is a strategy adaptive?

How to define similar (mathematical) situations?

mathematical / learner‘s perspective?

bridging metaphor



cultural context

- curricular developments (Catherine & Christine)
- number representations / materials (Uta & Marcus)
- algorithms (Anne-Marie)