



Realistic mathematics education in Dutch primary school textbooks

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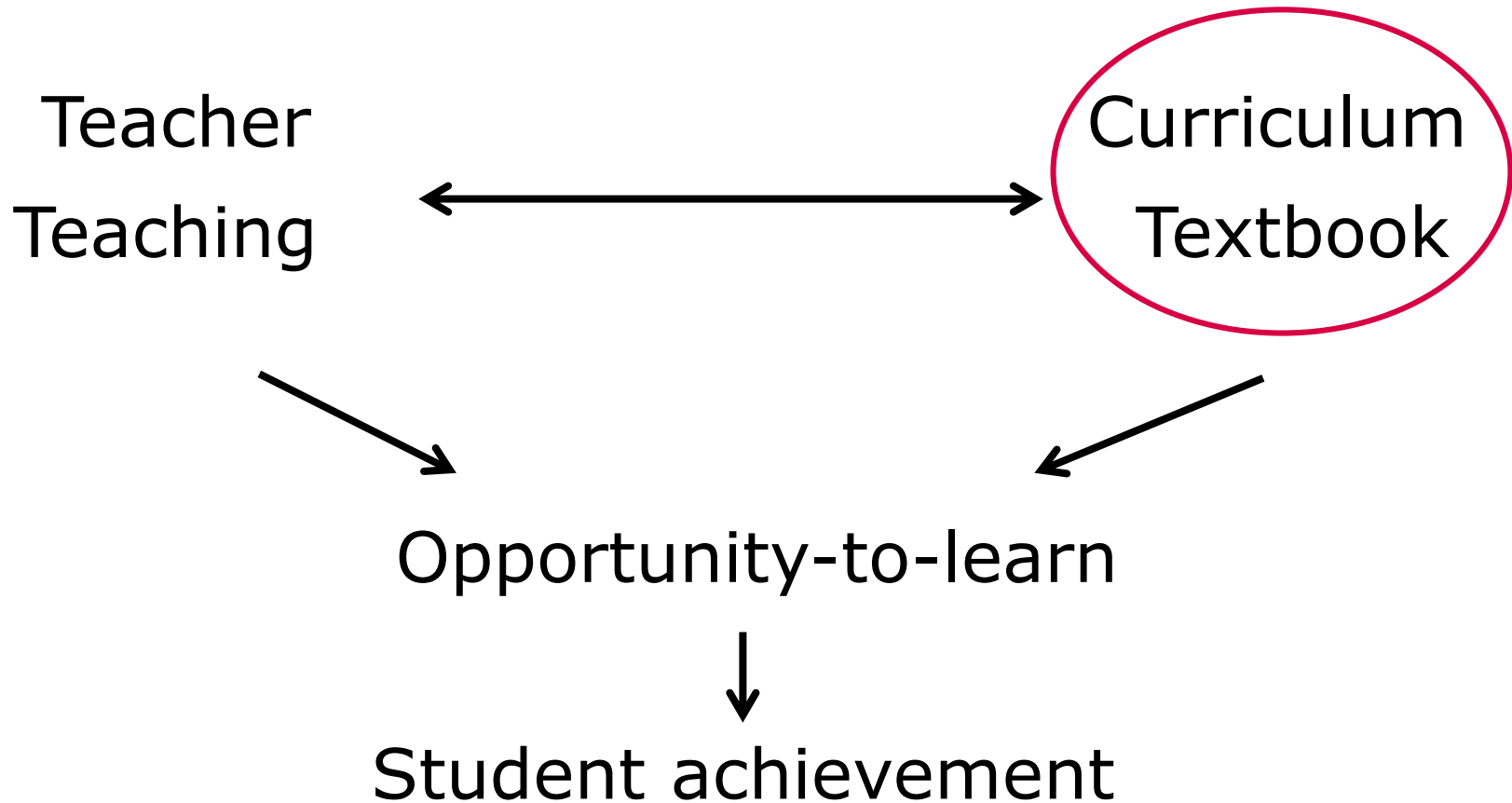


Netherlands institute for
curriculum development



Freudenthal Institute & Freudenthal Group,
Utrecht University, the Netherlands

Opportunity-to-learn (OTL)



INTENDED

*Intentions,
Aims & Goals*

**POTENTIALLY
IMPLEMENTED**

*Textbooks and Other
Organized Resource
Materials*

IMPLEMENTED

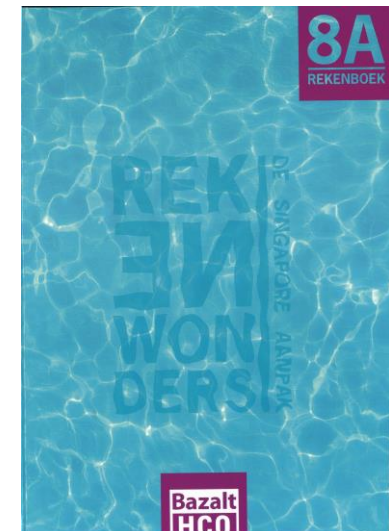
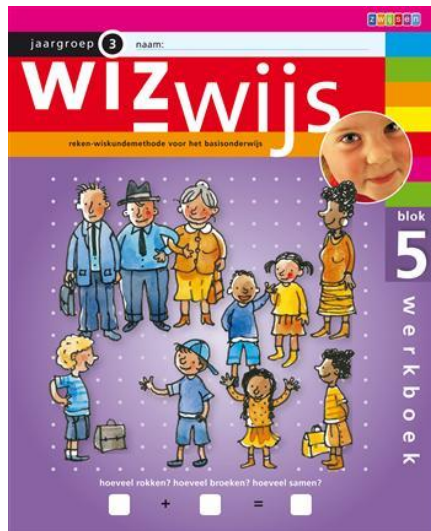
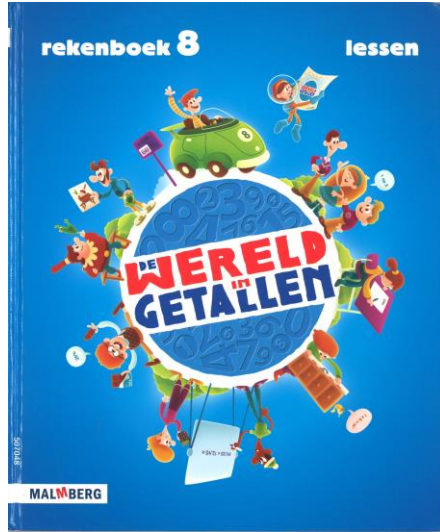
*Strategies, Practices
& Activities*

ATTAINED

*Knowledge: Ideas,
Constructs, Schemas*

*IEA Tripartite Curriculum Model
Valverde et al., 2002*

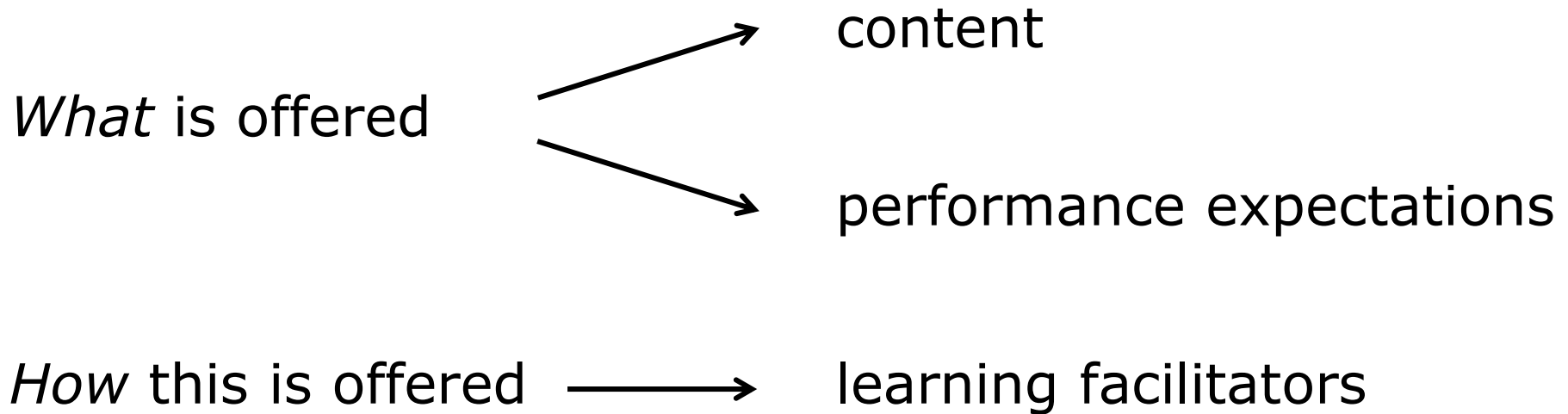
Textbooks in the Netherlands



Mathematics textbook use in Dutch primary schools

- About 94 % of Dutch primary school teachers indicate that a textbook is the main source of their teaching and for about 62 % a textbook is the only source they use *Meelissen et al., 2012; Scheltens et al., 2013*
- At least 80 % of the teachers follow the textbook content for more than 90 % *Hop, 2012*
- Thus, mathematics textbooks are of decisive influence on the Dutch' enacted curriculum

OTL and textbooks



Different tasks, different OTL

From left to right and from top to bottom always 100,000

100 000		
33 000		41 000
12 500	54 100	
54 500		25 600

Alles Telt Grade 6

Finish the number square.

			5 ↗
	$2\frac{1}{3}$	2	→5
3			→5
	1		→5
↓ 5	↓ 5	↓ 5	↘ 5

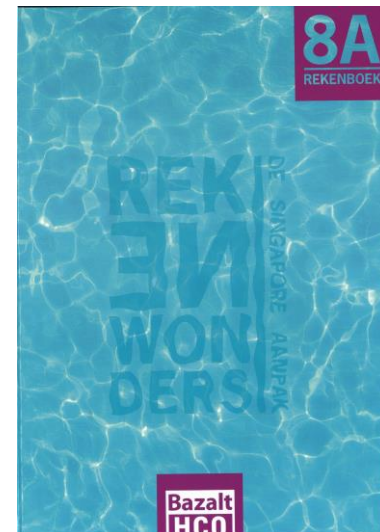
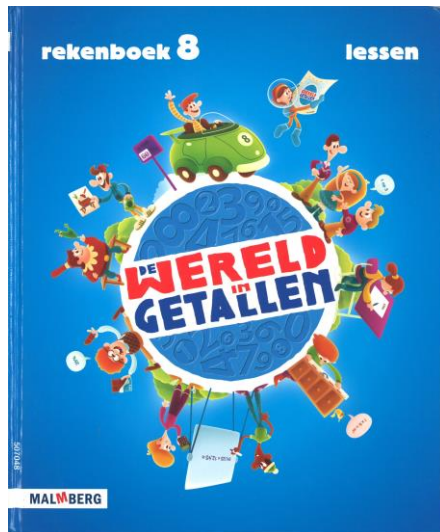
Pluspunt Grade 6

Write the numbers 1, 2, 3, 4, 5, 6, 7, 8, 9 in the white square. Make sure that three numbers in each directions always have the same sum. Use all numbers only once.

Pluspunt Grade 6

Methodological issues

- Textbooks to be included in the analysis
- Textbook materials to be included
- Unit of analysis
- Analysis framework and procedure

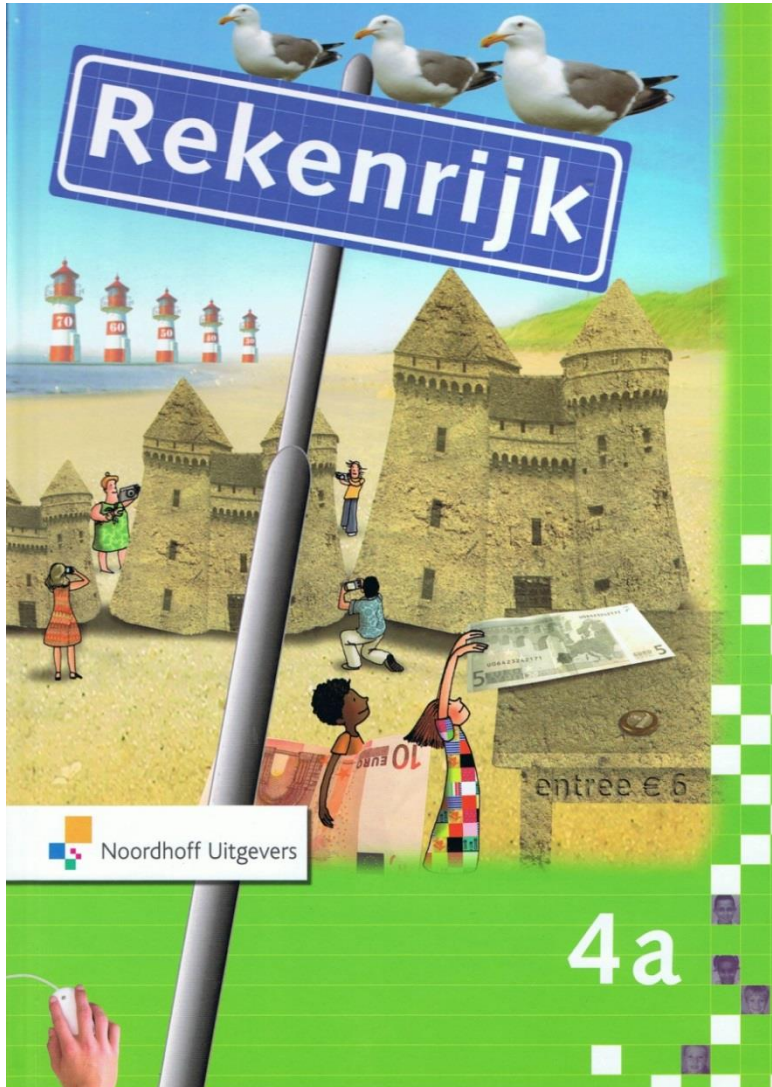


RME principles

- the activity principles
- the reality principle
- the level principle
- the intertwinement principle
- the interactivity principle
- the guidance principle

Van den Heuvel-Panhuizen & Drijvers, 2014

Subtraction up to 100 in Grade 2



Analysis framework

Subtraction up to 100

Perspective	Specification of the perspective
Content	Types of tasks Format of tasks Semantic structure
Performance expectations	Knowing subtraction facts Carrying out subtractions Applying subtractions Understanding of subtraction
Learning facilitators	Degree of exposure Structure of exposure Didactical support

Content: Semantic structure

	RR-tasks		RZ-tasks	
	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>
Taking away	210	18%	403	28%
Determining the difference	53	5%	0	0%
Both taking away and determining the difference	28	2%	0	0%
No distinguishable semantic structure	874	75%	1037	72%
Total number of subtraction-related tasks	1166	100%	1440	100%

Van plaatje naar rekentaal



som:

Hoe groot is het verschil?

69
verschil

72

a som:

antwoord:

Luister goed!

Floris heeft 12 ballonnen.
Hij geeft er 5 aan Tess.
Hoeveel ballonnen houdt Floris over?

De som is: - = ... ballonnen.



Learning facilitators:

Sequence in level of abstraction

Van plaatje naar rekentaal



som:

Hoe groot is het verschil?

69 verschil

72

a som:

antwoord:

$$11 - 6 = \dots\dots$$

$$11 - 8 = \dots\dots$$

$$14 - 7 = \dots\dots$$

$$13 - 5 = \dots\dots$$

Learning facilitators:

Sequence in level of abstraction

Level of abstraction		Sequence in sets of tasks on subtraction up to 20 in RR									
Application in contexts											
Bare number tasks											
Tasks with models											
Contexts supporting understanding											
Lesson #		1	2	3	4	5	6	7	8	9	10

Level of abstraction		Sequence in sets of tasks on subtraction up to 20 in RZ									
Application in contexts											
Bare number tasks											
Tasks with models											
Contexts supporting understanding											
Lesson #		1	2	3	4	5	6	7	8	9	10

Learning facilitators: Didactical support

Supporting models



$$62 - 35 = 27$$

Calculate with one or with more jumps.

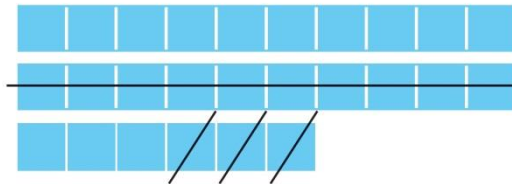


$$74 - 36 = \dots\dots$$

RR

Calculate with an in-between step

$$\begin{aligned} 26 - 13 &= \\ 16 - 3 &= 13 \end{aligned}$$



$$26 - 13 = 16 - \underline{3} = \underline{13}$$

$$34 - 22 = 14 - \dots\dots = \dots\dots$$

$$58 - 31 = 28 - \dots\dots = \dots\dots$$

$$47 - 11 = 37 - \dots\dots = \dots\dots$$

$$57 - 22 = \dots\dots - \dots\dots = \dots\dots$$

$$45 - 31 = \dots\dots - \dots\dots = \dots\dots$$

$$74 - 12 = \dots\dots - \dots\dots = \dots\dots$$

$$87 - 11 = \dots\dots - \dots\dots = \dots\dots$$

RZ

Discussion in small groups

Examples p. 3-7, Subtraction up to 100 in Grade 2

- What RME principles do you recognize?
- What do you notice?
- What do you wonder?

Exchange in the whole group

Thank you

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