

# Multilevel ICT design to support education and learning: Theory and practice

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## Overview

1. Introduction
2. Multilevel theory
3. Method:
  - development research
  - experimental research
4. First results
5. Discussion

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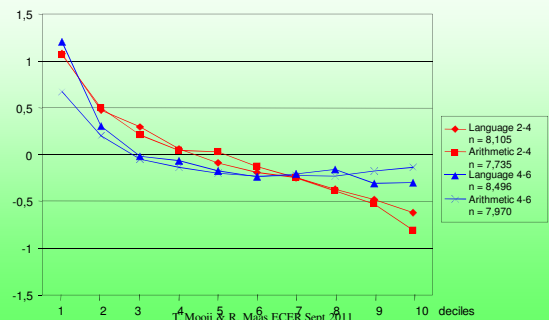
## 1. Introduction

Differences between pupils per competence / school subject area

	Low	Middle	High
<b>Beginning level</b>	Lower		Higher
<b>Learning steps</b>	Smaller		Greater
<b>Motivation</b>	Concrete		Abstract
<b>Structuring</b>	Task-based		Creative
<b>Working period</b>	Shorter		Longer
<b>Repetition</b>	With variation		New
<b>Coaching</b>	More often		Less often
<b>Self-regulation</b>	Less		More

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## Differences z-scores 2004-2002 Grades 2-4 (red) and 4-6 (blue)



## Longitudinal cohort high ability pupils

### Causal effects 2002-2004:

- class size: larger number pupils in class, negative effects
- age-based monitoring: negative effects
- class mean performance: higher mean, negative effects

### Teacher's functioning 2002 – 2004:

- acceleration: skipping grade(s) positive effects on motivation and behaviour in class, and on cognitive performance

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## Research question

HOW TO SUPPORT LEARNING PROCESSES OF PUPILS WITH DIFFERENT ABILITIES, INCLUDING SELF-REGULATION ABILITIES, TO REALISE THAT ALL CAN ACHIEVE ACCORDING TO THEIR POTENTIALS IN PRESCHOOL - PRIMARY SCHOOL?

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## 2. Multilevel theory

Various types of variables  
education, instruction, learning, personal  
individual, group, school levels  
interactions at / between levels  
resulting in specific but related  
multilevel longitudinal  
processes and effects

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## Learning psychology at pupil level: Self-regulation and learning tasks

Zimmerman (2000):

Self-regulation: self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals

Competence-based learning:

- estimation of difficulty level of task - selection
- types of support or coaching of task execution
- assessment or evaluation of results

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## Systemic design to improve education and learning

### Educational contextual dimensions:

- Differentiation of learning materials and procedures
- Integration by and use of ICT support (in multilevel ways)
- Strategies to improve development and learning
  - Beginning char., prosocial rules, small groups, self-regulation

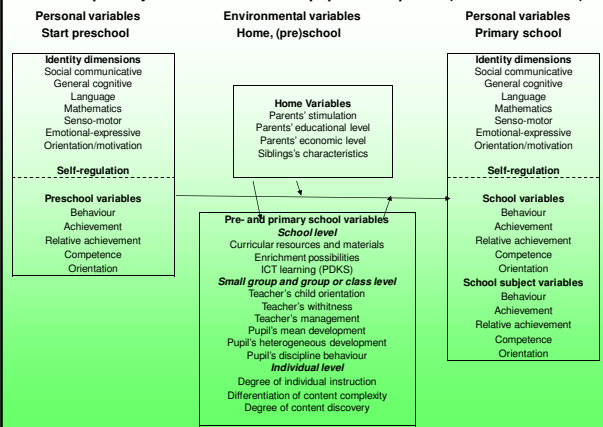
### Four aspects of learning processes:

- Diagnostic, instructional, managerial, systemic

### Combining dimensions and aspects: Optimal education

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### Pre- and primary school influences on pupil development (three-level model)



## Hypothesis

Compared with their learning in traditional education, in optimal education – learning conditions both low and high ability pupils will improve their social, emotional and cognitive learning processes in particular because of the adequate integration of these pupils' self-regulatory capacities in the instructional designs.

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## 3. Method

### Projects 'contextual learning model'

- Development of prototype Pedagogical Didactic Kernel Structure
- Screening of beginning characteristics
- Development of prototype software
- Pilots in preschool / primary school
- Collaborative research and development in practice
- Two experimental longitudinal projects

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## 4. First results

### Pedagogical-Didactic Kernel Structure

Competence domains:

- language
- general - cognitive
- social - emotional
- arithmetic / mathematics
- physical - medical
- general - psychological
- motor

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Diagnostic, Instructional, and Management Systems

Entry characteristics by parents

Estimated general intelligence level  
Questionnaire for Peter Testfamily

Compared to children of the same age, a quality of this child is

- wanting to know the surrounding area the same
- being able to understand somewhat less
- finding out things independently - choose -
- depth in interests - choose -

dropdown menu for 'depth in interests':

- choose -
- less
- somewhat less
- the same
- somewhat more
- more

main menu  
logout

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vergelijkbare groepen: Groep 1

vergelijkbare vragenlijsten:

- Beginkenmerken door leerkrachten 26-09-2008 9:27
- Beginkenmerken door peuterspeelzalen 26-05-2008 12:04

overzicht afdrukken

**Beginkenmerken door ouders**

rapportage over: Marian Brekelmans

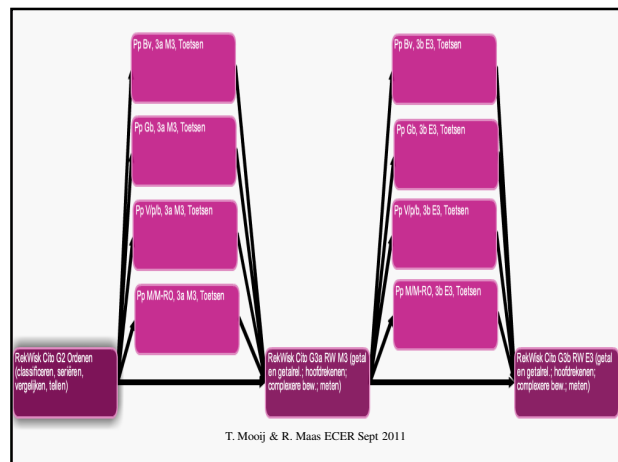
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inwoner: Peter Brekelmans

Unit Rood | aantal leerlingen met relevante gegevens in de groep: 25

		bereik: 0	5
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	ouderverzorger gem.	3,0	<div style="width: 60%;"></div>
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	Groep 1 gem.	2,9	<div style="width: 58%;"></div>
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Oeschat taalniveau	Norm gem	3,2	<div style="width: 64%;"></div>
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	leerkracht gem.	2,9	<div style="width: 58%;"></div>
	PSZ-begeleider gem.	3,5	<div style="width: 70%;"></div>

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## Implementation

### Pilots in preschool and primary school

- collaboration with pre- / primary school teachers
- screening of beginning characteristics four-year olds
- experiences in practice:
  - collaboration between parents and teachers
  - multi-perspective communication about competence levels
  - introduction of appropriate levels of play / learning materials
  - further specific educational support in prosocial small groups

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Reliabilities screening scales, per type of respondent

Screening scales (number items)	Day-care		Parents		Preschool	
	N	Alpha	N	Alpha	N	Alpha
Social-communicative level (2)	52	.97	134	.97	118	.91
General cognitive level (4)	51	.87	133	.62	117	.82
Language proficiency level (5)	34	.97	113	.82	106	.86
Pre-arithmetic level (4)	30	.89	119	.84	109	.92
Emotional-expressive level (5)	45	.87	131	.87	116	.82
Sensorimotor level (4)	50	.88	124	.77	109	.81
Expected educ. behave./motiv. (4)	48	.93	131	.83	116	.85

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Differences in mean scores

Screening scales	Mean <sup>a</sup>			Mean <sup>b</sup>			Mean <sup>c</sup>		
	Day-care	Par-ents	T <sup>d</sup>	Day-care	Pre-school	T <sup>d</sup>	Par-ents	Pre-school	T <sup>d</sup>
Social-communicative	3.43	3.32	-.62	3.43	3.41	-.15	<b>3.18</b>	<b>3.46</b>	<b>-3.49**</b>
General cognitive level	3.60	3.57	-.32	3.60	3.53	-.59	3.52	3.63	-1.91
Language proficiency	3.28	3.41	1.24	3.28	3.44	1.48	3.39	3.49	-1.58
Pre-arithmetic level	3.24	3.36	1.12	<b>3.22</b>	<b>3.55</b>	<b>2.93*</b>	<b>3.36</b>	<b>3.52</b>	<b>-2.76*</b>
Emotional-expressive	3.43	3.67	1.82	3.42	3.55	1.43	3.50	3.56	-1.14
Sensorimotor level	<b>3.48</b>	<b>3.20</b>	<b>-2.33*</b>	<b>3.48</b>	<b>3.24</b>	<b>-2.23*</b>	<b>3.23</b>	<b>3.37</b>	<b>-2.41*</b>
Exp. educ. beh./motiv.	3.51	3.45	-.58	3.52	3.57	.49	<b>3.39</b>	<b>3.58</b>	<b>-3.38**</b>

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## 5. Discussion

1. Self-regulation of pupils and criterion-based education and learning
2. Self-regulation of pupils and norm-based pupil monitoring
3. School-based innovation, ICT at multiple levels, and self-regulation of school teams

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