

# Measurement Issues

## ICO theme Domain-specific Instruction

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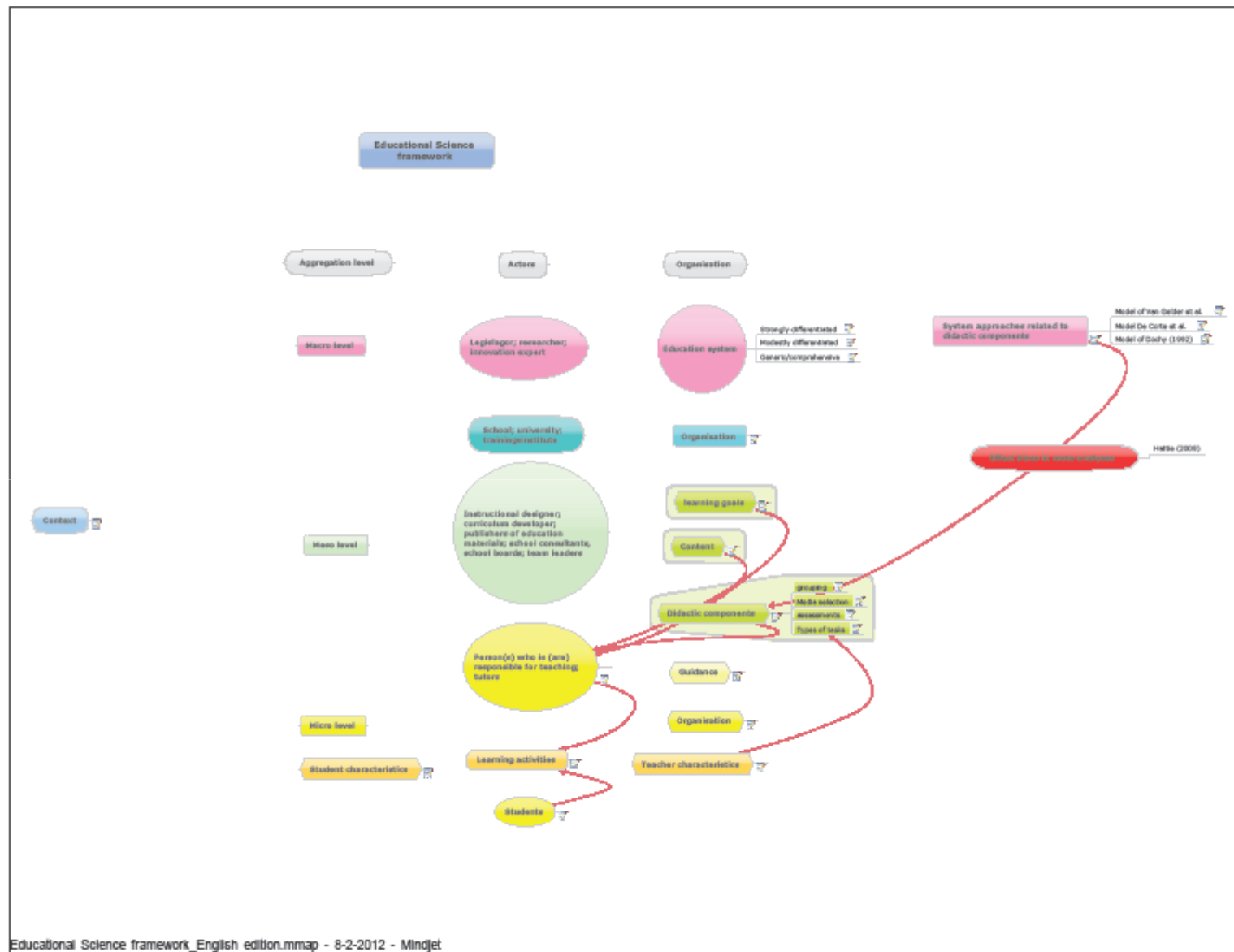


# Overview

- Did we study our research object from a micro-, meso, or macro perspective?
- What is the relation between the **micro, meso, and macro levels of research** and the **levels of theories** as presented by Arthur Bakker?
- The consistency between theory (concepts), methods, and techniques
- The role of conceptual frameworks in different disciplines at different levels
- To which degree do the different levels of theories and methods affect our results?
- An example: the competency concept in the domain of BA.



# The Educational Science Framework



# Group task nr 1

- Did you (or are you going to) study your research object from a micro-, meso, or macro perspective, or perhaps, from multiple levels?



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## Reminder layeredness of educational theories

- **‘Grand theories’** (e.g. Piaget). How ‘hard’ are age-related stage theories? More evidence of stages available in expertise research?
- **Orienting frameworks** (e.g. constructivism; socio-cultural theories). What is the difference between constructivism and CCHs?
- **Frameworks of actions** (e.g. pedagogical strategies; e.g. build communities of learners, learning by designing). Are learning activities also part of frameworks of actions? Is learning part of a framework of actions?
- **Domain-specific instruction theories** (e.g. realistic math education). What is the relationship with authentic tasks?
- Are **ontological innovations** embedded in learning theories, developmental theories, teaching theories, instructional design theories, measurement theories, policy theories, economic theories? What are the differences/similarities?



## Theory, methods, and techniques

- Research questions determine the research methods;
- Research questions are derived from theory. Hence, theory determines the research questions;
- Methods determine the statistics techniques which can be selected.

There should be coherence between the theory, methods, and techniques.

Mellenbergh (1980). Theory at different levels. *Nederlands Tijdschrift voor de Psychologie* (35), 275-288.



## The role of key concepts and conceptual frameworks in different disciplines at different levels

- Concepts are overarching aggregations of facts – abstractions to understand specific parts of our world.
- Empirical concepts vs theoretical concepts
- Theoretical concepts are the instruments with which we make the interrelationships in reality conceivable (Heldring, 2009, p.158)
  
- Examples in natural science: force, speed, time, volume, weight, etc.
- Examples in educational science: knowledge; formal, informal and non formal learning; tasks; curricula, development; metacognition; schemata or mental maps; implementation of innovations, internationalization, etc.
- Examples in business administration: cash flow; turnover; gross sales; investments; capital costs; purchasing; management; costs- benefits.
- Examples in economics: markets; inflation; recession; human capital, etc.



## Concepts are instruments to operationalize and measure (a part of the) world

- Concepts are not directly observable. They have to be described and defined.
  - Definitions lead to operationalizations – making concepts measurable, and empirically testable.
- Hence, concepts define the **research methods (focussing on finding general laws or principles)**. To explain and predict.
- Methods in natural sciences: Experiments; observations
  - Methods in educational science: Experiments; DBR; cross-sectional quantitative designs; longitudinal studies; descriptive, qualitative studies (observations); case studies; mixed models
  - Methods in business administration: case studies; descriptive, qualitative studies; cross-sectional correlational studies; meta-analyses; few experiments
  - Examples in economics: Quantitative large scale cross-sectional or longitudinal correlational studies.





**To which degree do methods and instruments  
affect our results?**

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*Lifelong learning in the professions:  
how psychologists, educational  
scientists, and managers differ from  
each other*

*A comparison of three analyses using one and the same database*

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## Three analyses: factors and correlations

	EFA	CFA	Rasch
	3	7	4
1 SDCC	X	XX	X
2 SDLC	X	XX	X
3 SE	X	XX	X
4 SRLC		X	X

### Correlations

Positive and significant, except for SDLC and SE according to EFA in BA.

In CFA BA has not been analyzed.



## Three analyses: predictors

		GPA		ECTS			
		ES	PSY	BA	OW	PSY	BA
EFA	1 SDCC	X					
	2 SDLC						
	3 SE		X		X		
	4 SRLC						
CFA	1 SDCCA or B						
	2 SDLC <b>B</b>	X	(x)				
	3 SEA	(x)	X		X	X	
	4 SRLC						
Rasch	1 SDCC						X
	2 SDLC						(x)
	3 SE	X	X		X	X	((x))
	4 SRLC						

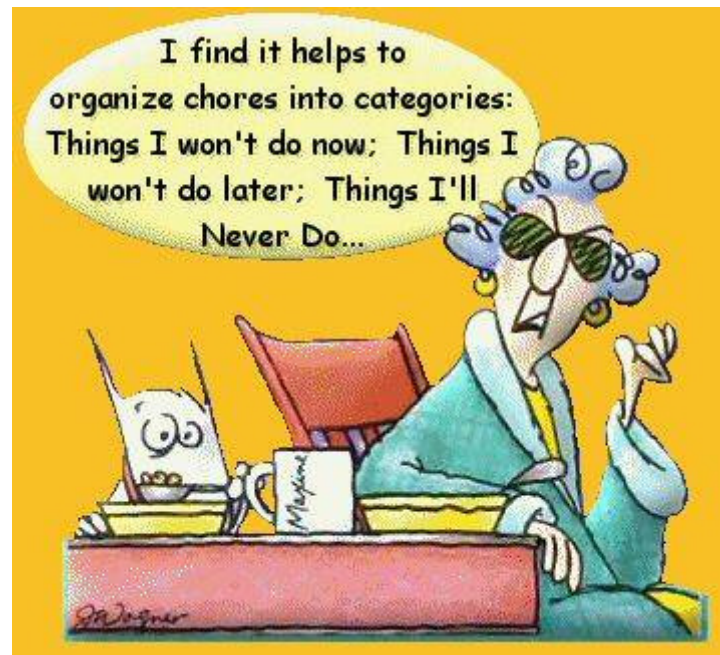
## Three analyses: differences between groups

	EFA	CFA	Rasch
SDCC			X
SDLC	X		X
SE	X	X	
SRLC		X	X

EFA no distinction between premaster/master  
EFA and CFA analyzed differences in two instead of three professions.



## Does it matter which method you choose?



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## An example: the competency concept

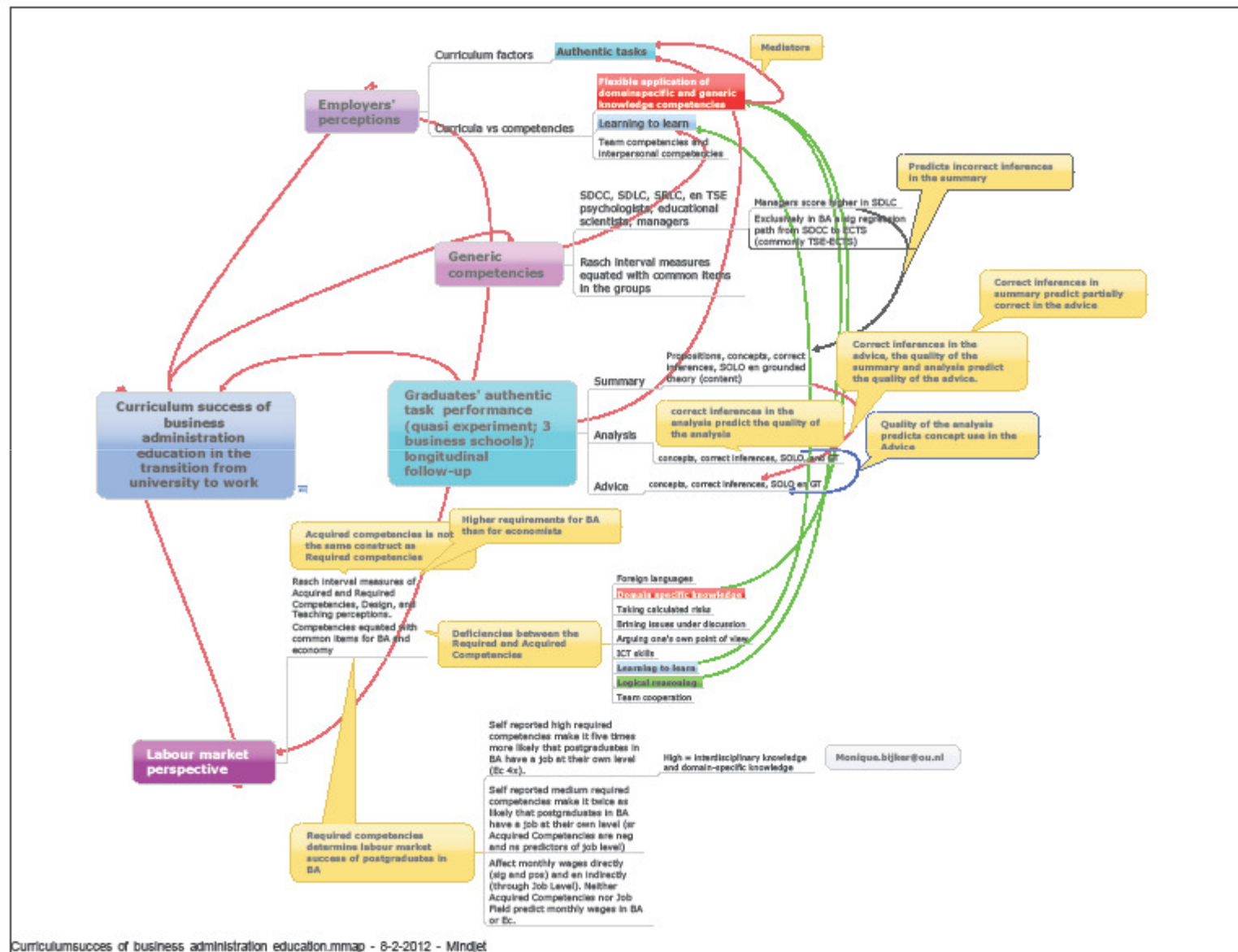
Plays a role in

- Labour market theories - Indicators of economic growth – operationalized in wages
- Organization theory – operationalized in the key competencies of an corporation (comparative advantage).
- Educational science theories – integrated knowledge, skills, and attitudes. Operationalized in performances on authentic tasks. Triangulation. Multiple methods.
- Educational psychology - learning theories – behavioural and cognitive psychology. Operationalized in sustainable changes in the behavioural repertoire, or in the accumulation of declarative knowledge, procedural knowledge, or/and? conditional knowledge.
- Developmental psychology – operationalized in characteristics, belonging to certain stages (e.g. the Neo-Piagetian SOLO taxonomy)





# Competencies and different perspectives/levels



## Group task nr 2

- Which **level(s)** of theory (theories) and which specific theories are you using in your research project?
- Which concepts are your key concepts?



**Thank you for your attention!**

• Questions?

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