

# Computer-Based Assessment und Komplexes Problemlösen



## Neue Technik, neue Konstrukte?

# Computer-Based Assessment und Komplexes Problemlösen

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DFG-Schwerpunktprogramm

Kompetenzmodelle zur Erfassung individueller  
Lernergebnisse und zur Bilanzierung von Bildungsprozessen

UNIVERSITÄT  
DUISBURG  
ESSEN





## Agenda

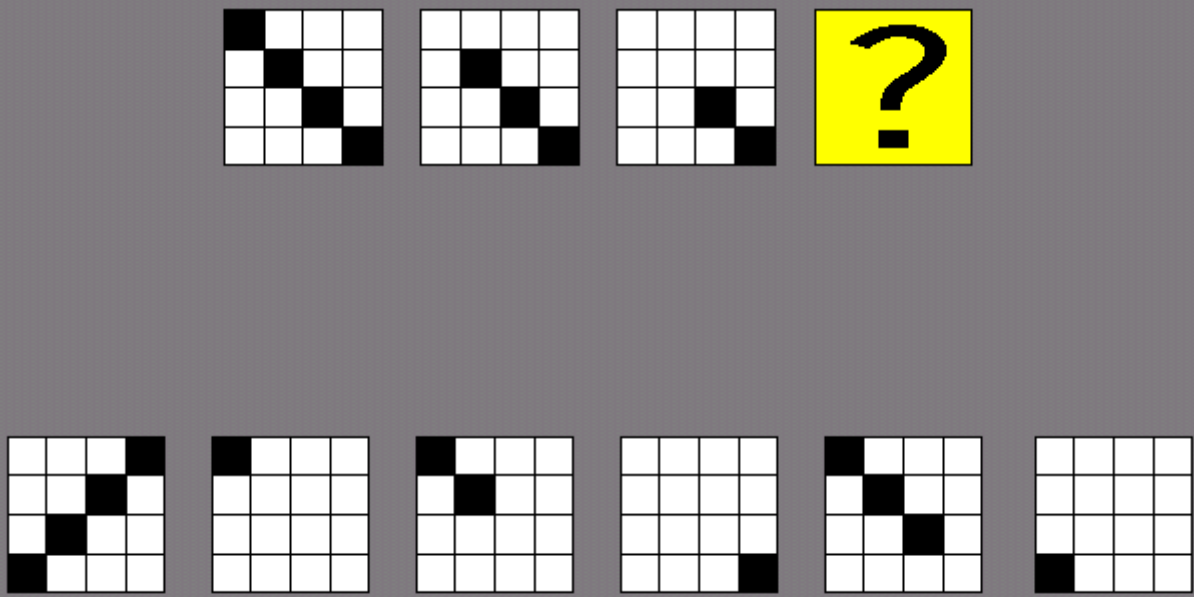
1. Vorteile von Computer-Based Assessment
2. CBA und neue Konstrukte
3. Ein Beispiel: Komplexes Problemlösen in PISA 2012
4. Was erwartet uns?

## Vorteile von Computer-Based Assessment

- Überführung von P&P-Testverfahren auf den Computer
- Vorteile (z.B., Scheuermann & Björnsson, 2009; Van der Linden & Glas, 2000)
  - Standardisierung
  - Automatisches Scoring
  - Adaptives Testen
- Nachteile/Herausforderungen (z.B., Clariana & Wallance, 2002; Johnson & Green, 2006)
  - Äquivalenz zwischen P&P-Testverfahren und Computerversion muss gesichert sein

# Computer-Based Assessment und Komplexes Problemlösen

Item 1



4:41

<< >>

## Vorteile von Computer-Based Assessment

- Gibt es noch weitere Vorteile von CBA?
- Anders gefragt: Können wir den Computer nutzen, um unsere diagnostischen Verfahren substantiell zu verbessern und unser Blickfeld zu erweitern?





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## CBA und neue Konstrukte

- Computer-simulierte Testumgebungen können genutzt werden, um
  - bestehende Konstrukte breiter zu erfassen
  - neue Konstrukte diagnostisch zugänglich zu machen
- Potential:
  - Interaktion zwischen User und Testverfahren
  - Realistischere Simulation von Alltagsanforderungen
- Beispiele:
  - Complex Problem Solving
  - Scientific Inquiry
  - Collaborative Problem Solving

Find out about the relationships and plot them in the model!

Round 5 105



**Training A**  
- - o + ++  
[Slider]

**Training B**  
-- - o + ++  
[Slider]

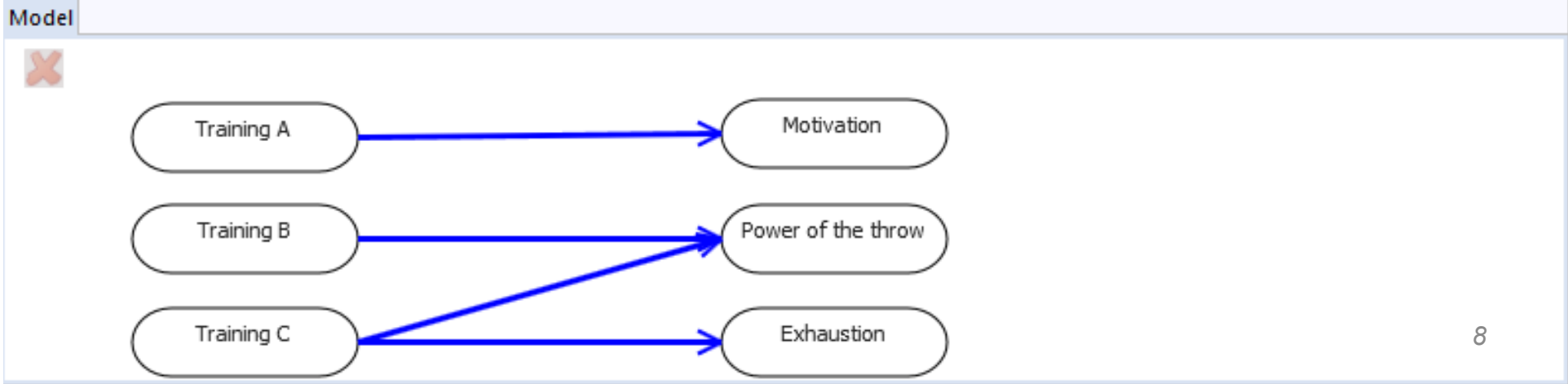
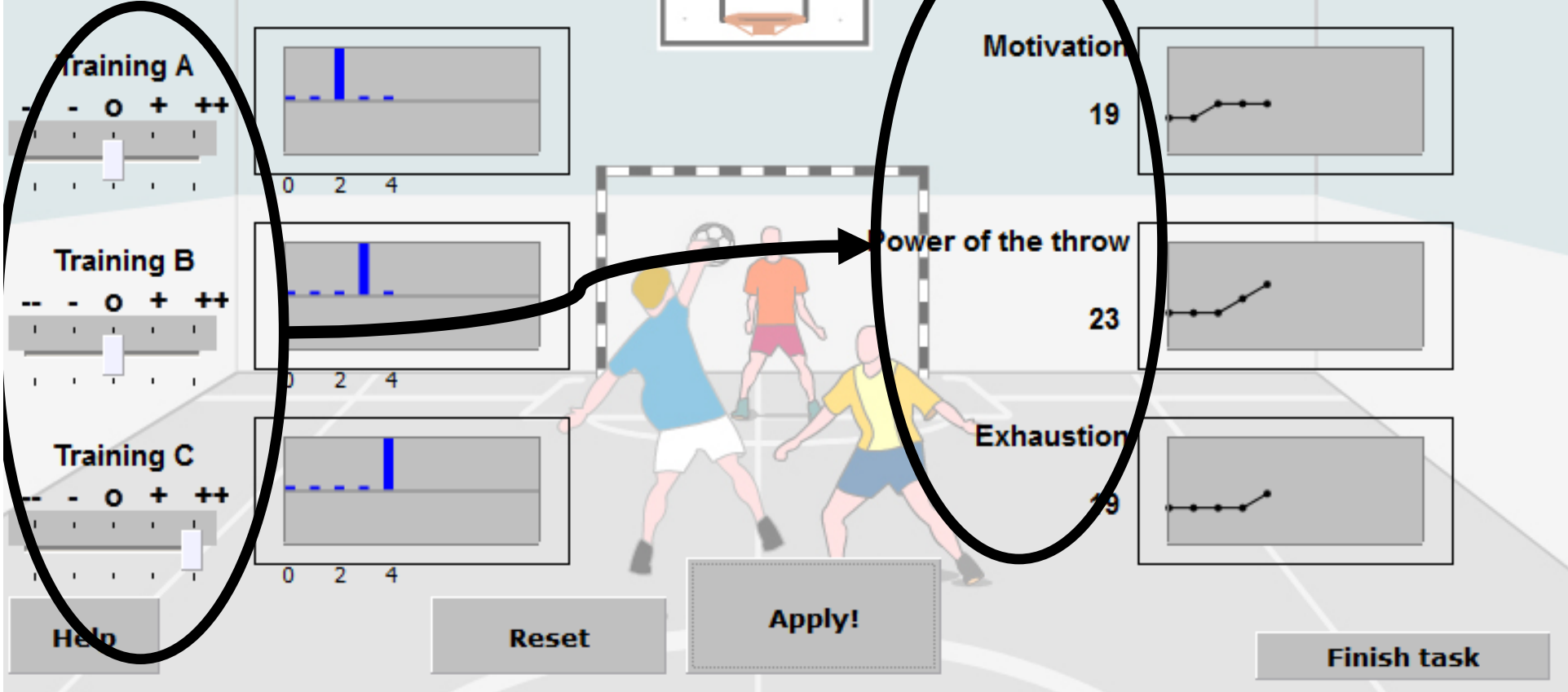
**Training C**  
- - o + ++  
[Slider]

**Motivation**  
19

**Power of the throw**  
23

**Exhaustion**  
19

Help Reset Apply! Finish task





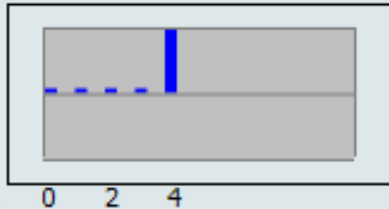
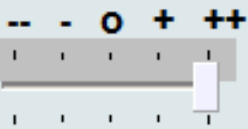
Reach the given target area in no more than four steps! Round 5



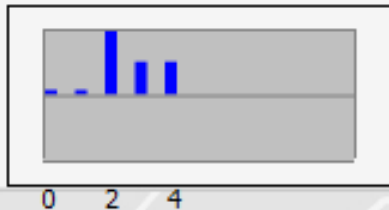
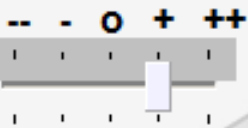
70



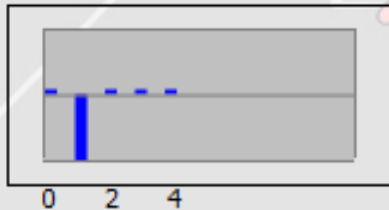
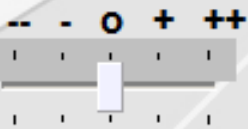
Training A



Training B

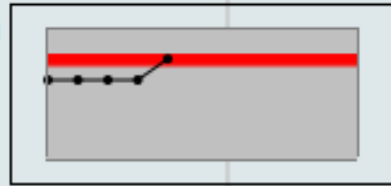


Training C



Motivation

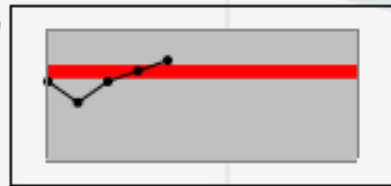
19



[ 18-20 ]

Power of the throw

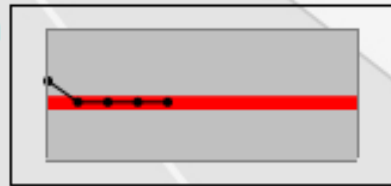
19



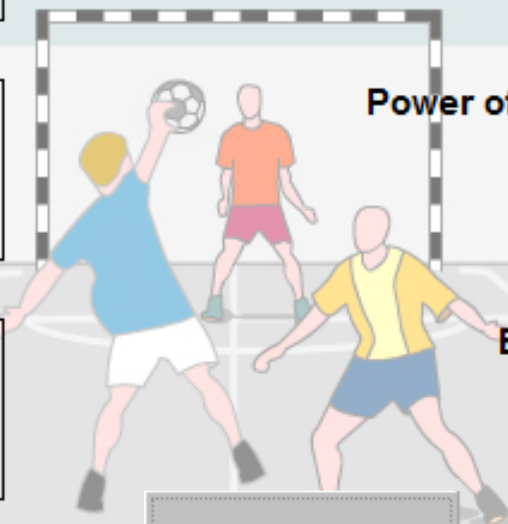
[ 16-18 ]

Exhaustion

11



[ 10-12 ]



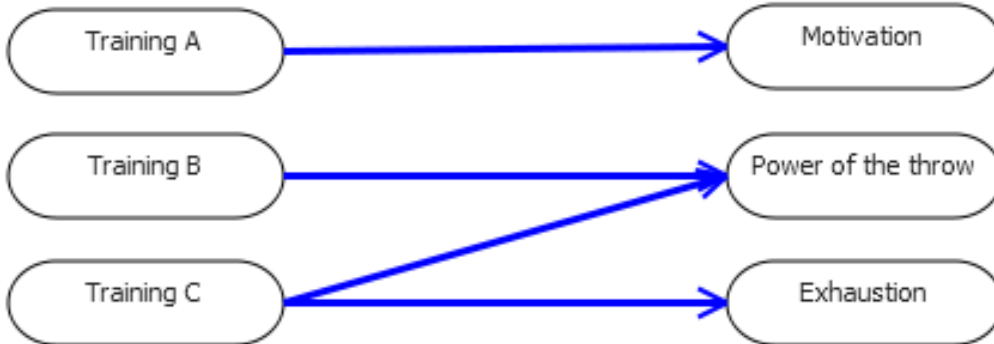
Help

Reset

Apply!

Finish task

Model



Selection panel for simulation components:

- barometer
- galvanometer
- thermometer
- windmeter
- tachometer
- hygrometer
- blade
- mast

Simulation area showing a wind turbine on a brown ground surface against a blue sky background. The turbine has three blades with orange tips. A green 'run' button is located at the bottom right of the simulation area.

Current readings:

- 0 kWh (with galvanometer icon)
- 0 m/s (with windmeter icon)

Data Collection 1

Clear Delete

4	527	4		3	10
6	744	6		3	10
8	744	8		3	10
10	744	10		3	10
12	744	12		3	10
14	744	14		3	10
16	744	15		3	10

Legend:

- time (blue)
- galvanometer (red)
- windmeter (purple)
- hygrometer (orange)
- mast (pink)
- barometer (yellow)
- thermometer (green)
- tachometer (light green)
- blade (cyan)

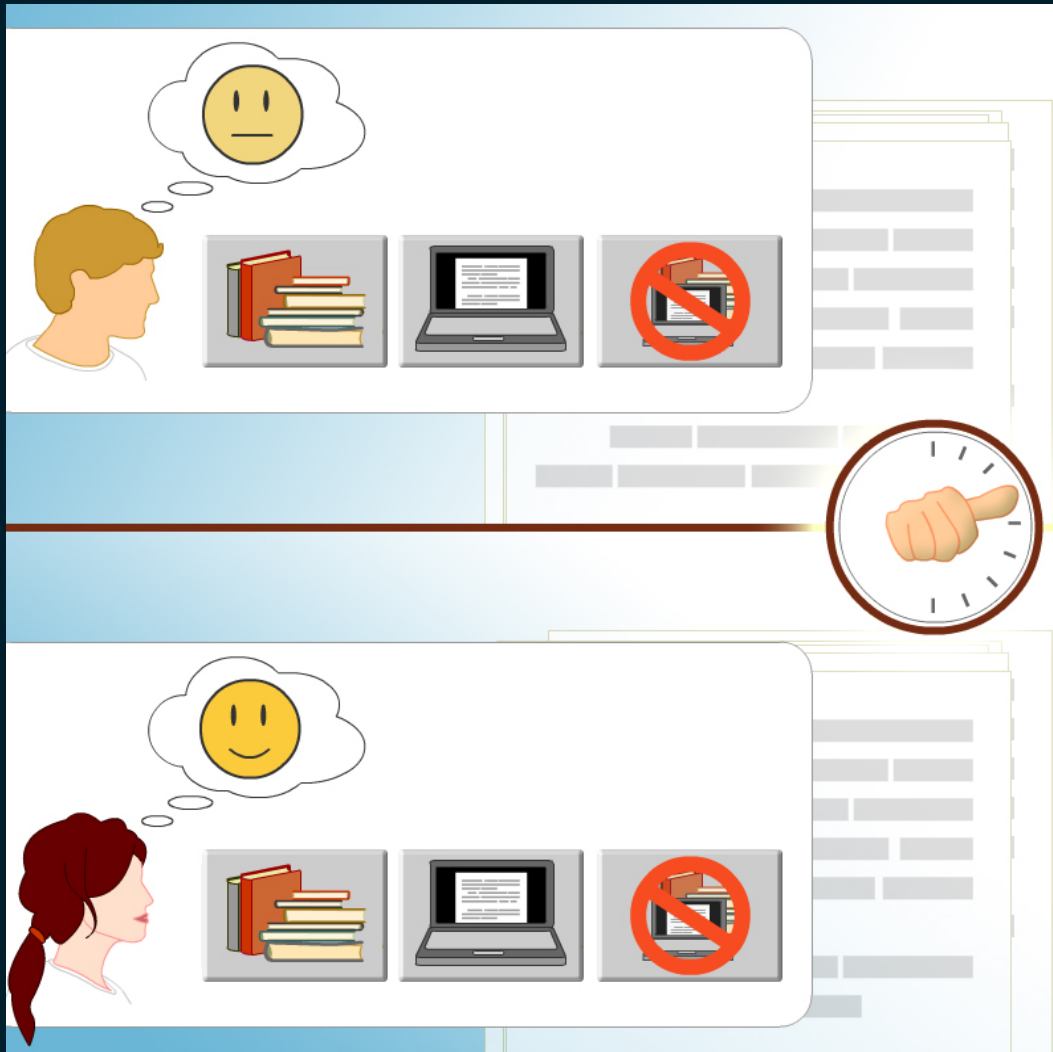
Your task is to find out which factors have an influence on the amount of electric power produced by the windmill.

**Question 1.** How can we describe the general relationship between wind speed and the amount of produced electric power by the windmill?

1 / 5

interval: 2 s

Record Stop



Chat-Log

**Jan:** *Please do the inquiry.*

**Anna:** What will you do?

**Jan:** *I 'll do the writing. I think that 's what I 'm good at.*

**Anna:** Okay.

Messages ▲

Send



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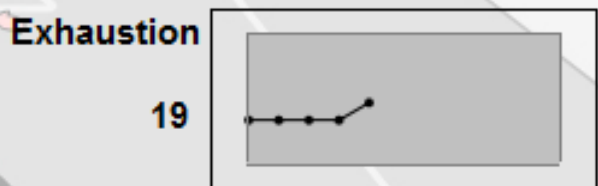
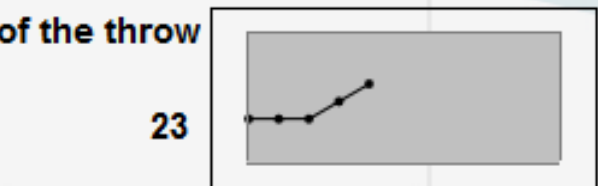
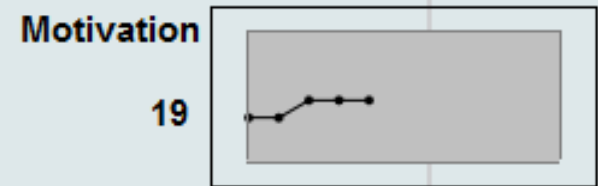
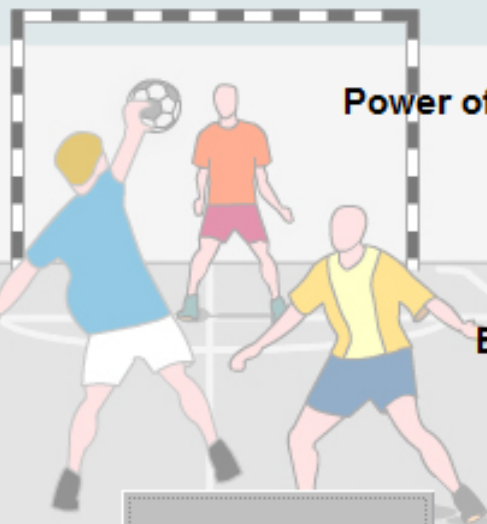
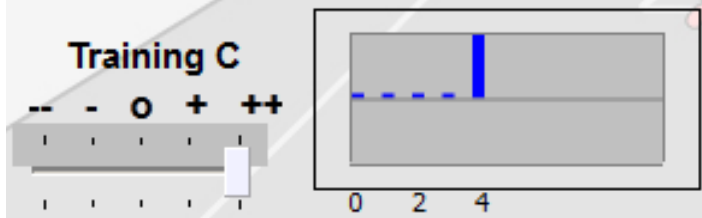
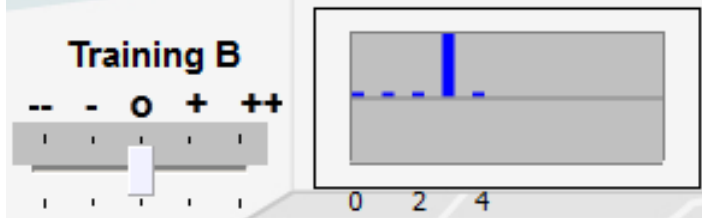
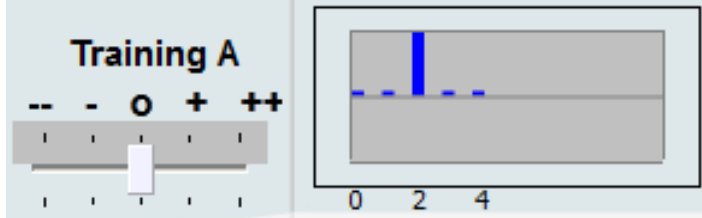
## Programme for International Student Assessment (PISA)



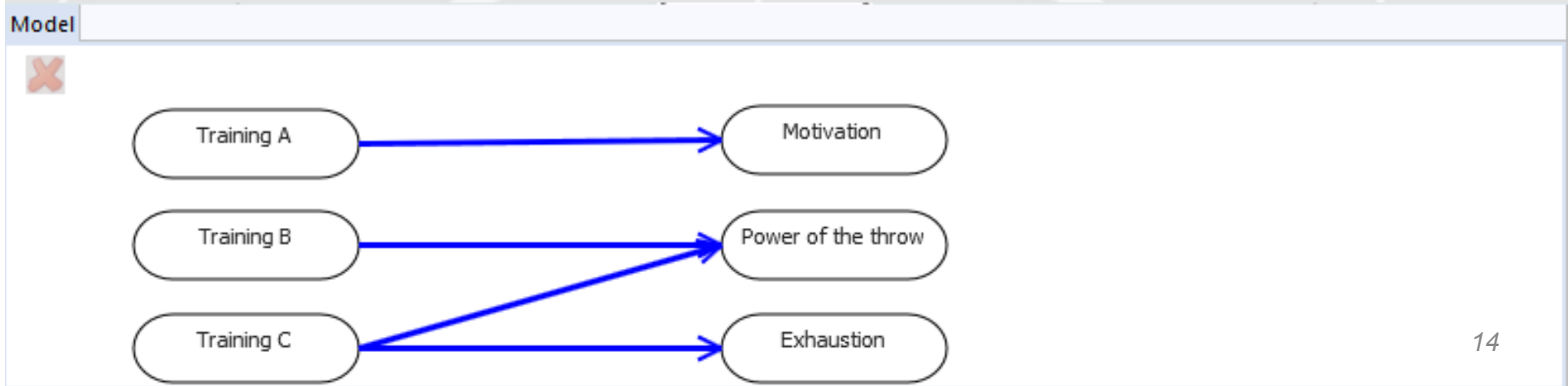
- 500.000 15-year old students worldwide representing 28 million students in more than 70 countries
- 2012: Computer-based Complex Problem Solving
- 2015: Computer-based Collaborative Problem Solving

Find out about the relationships and plot them in the model!

Round 5   105



**Help** **Reset** **Apply!** **Finish task**



## Programme for International Student Assessment (PISA)



2007: Kick-off des SPP

2008: Theoretische Ableitung & Item

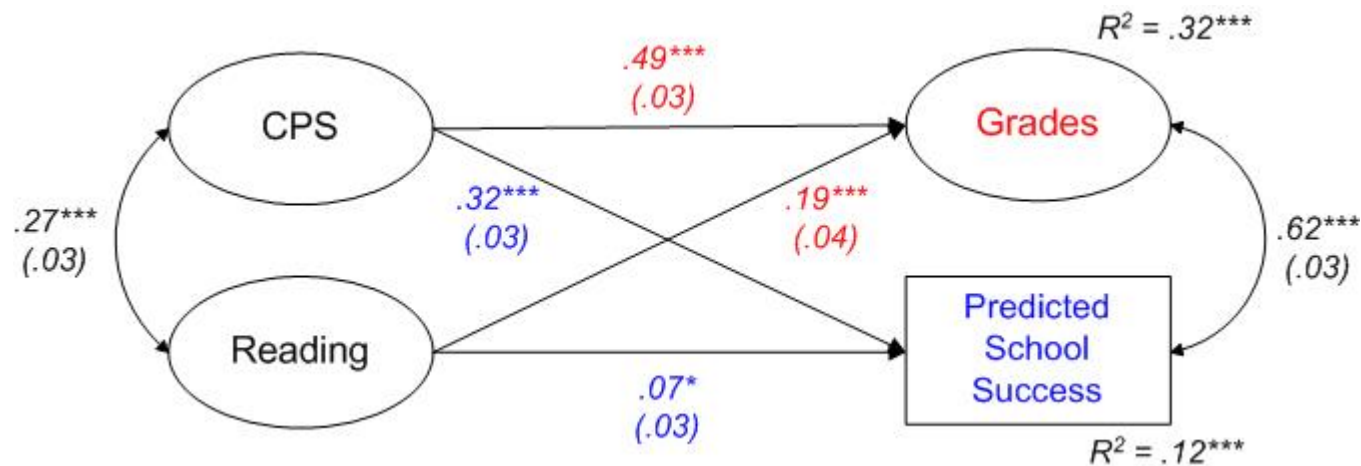
2009: Empirische Arbeiten

2010: PISA 2012 Framework & items

Seit 2010: umfassende Validierung

# Computer-Based Assessment und Komplexes Problemlösen

$\chi^2 = 137.69$ ,  $df=47$ ,  $p=.001$ ,  
CFI=.98, RMSEA=.03



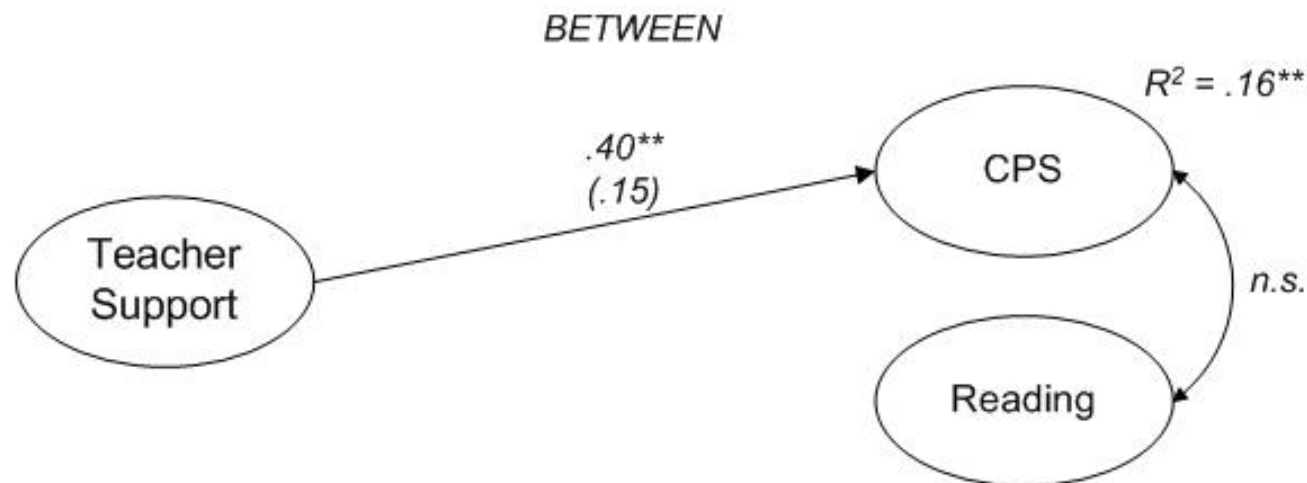
Greiff, S., Wüstenberg, S., Molnar, G., Fischer, A., Funke, J., & Csapo, B. (2013). Complex Problem Solving in educational settings – something beyond g: Concept, assessment, measurement invariance, and construct validity. *Journal of Educational Psychology*, 105, 364-379.

Wüstenberg, S., Greiff, S., & Funke, J. (2012). Complex Problem Solving. More than reasoning? *Intelligence*, 40, 1-14.



# Computer-Based Assessment und Komplexes Problemlösen

$\chi^2 = 359.30$ ,  $df=255$ ,  $p=.001$ ,  
CFI=.98, RMSEA=.02



Greiff, S., Fischer, A., Wüstenberg, S., Sonnleitner, P., Brunner, M., & Martin, R. (2013). A multitrait-multimethod study of assessment instruments for Complex Problem Solving. *Intelligence, 41*, 579-596.

Molnar, G., Greiff, S., & Csapo, B. (2013). Inductive reasoning, domain specific and complex problem solving: relations and development. *Thinking Skills and Creativity, 9*, 35-45.

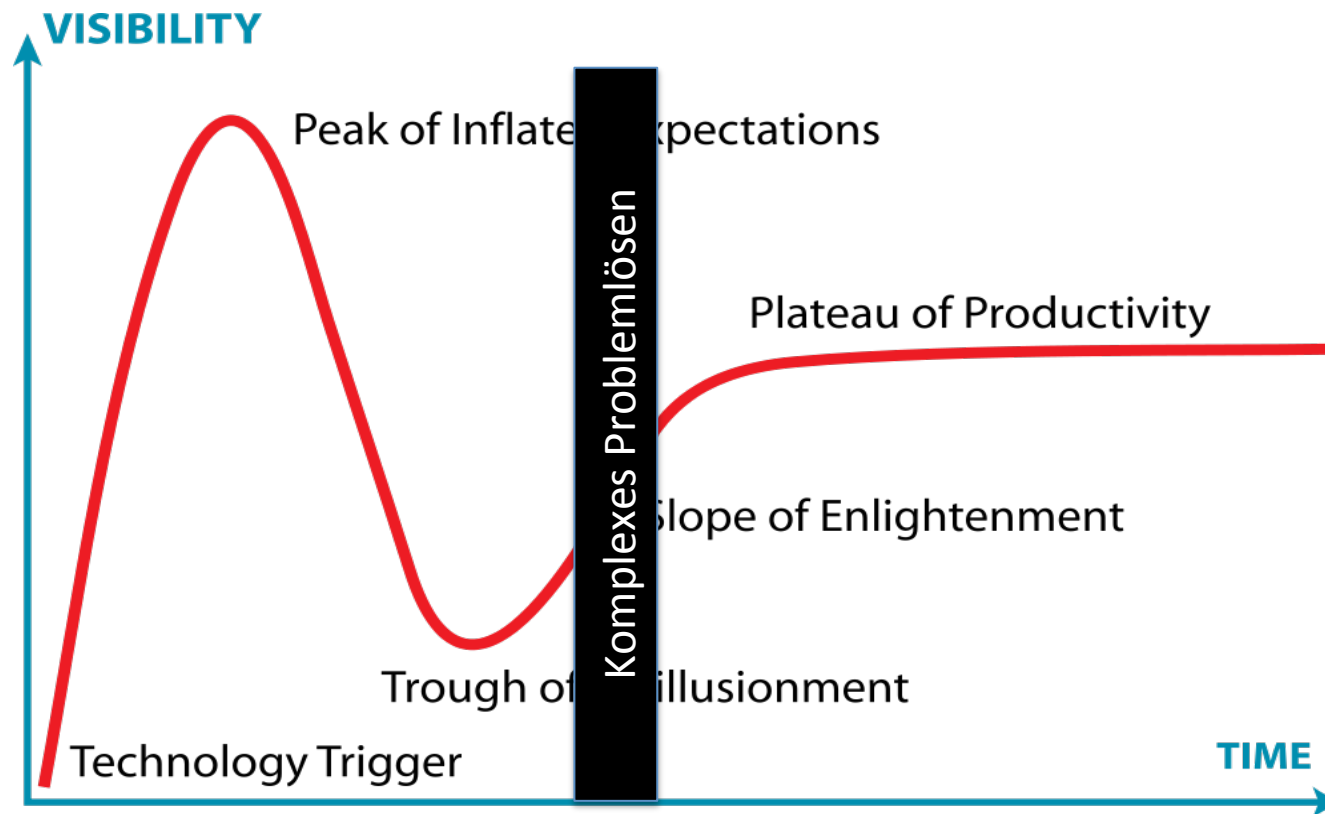


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## Gartner's Hype Cycle für neue Technologien







## Fragen und Diskussion

