

How can the acquisition of complex teaching skills be optimally fostered?

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Theoretical Background: Motivation

- Theory-practice gap = biggest challenge in teacher education (Voss et al., 2019)
- Possible solution: core practice trainings
 - CPs = holistic & domain-general teaching activities, high frequency, research-based
 - Novices can master them at basic level (McDonald et al., 2013)
- Prominent training approaches from practice-based teacher education lack scientific foundation
 - We want to bring teacher education and instructional design in a dialogue!
- “Composition question” (Nückles & Kleinknecht, 2024):

What phases should a core practice training be composed of?

Theoretical Background:

What phases should a core practice training be composed of?

- **Learning Cycle** (McDonald et al., 2013)

- Instructional model from practice-based teacher education
- How to teach core practices?
- Most important principles:
 - Provide modelling / examples
 - Provide approximations of practice
 - Allow practicing with students
 - Facilitate collaborative reflection (feedback)



- **ACT-R** (Anderson, 1982)

- Skill acquisition model from Cognitive Psychology
- How to acquire complex skills?
- Most important principles:
 - Develop **principle-based representation** of skill
 - Study modelling / examples to facilitate execution of skill
 - Practice skill to automate execution



Essential instructional phases of a core practice training:

Principle-based
explanation

Modelling

Practicing with
students

Theoretical Background: Content of our Core Practice Training

„Supporting students’ self-regulated reading of scientific texts“

= domain of practice

Importance shown by
PISA and IGLU large
scale assessments



is put into practice by the instructional activity

Reciprocal Teaching (Palincsar & Brown, 1984)

Theoretical Background: Content of our Core Practice Training

Palincsar & Brown, 1984, Rosenshine & Meister, 1994, Seuring & Spörer, 2010

• Reciprocal Teaching

- Collaborative reading technique to promote students' reading comprehension
- Students in small groups take turns assuming the role of discussion leader
- 4 reading strategies: questioning, summarizing, clarifying and predicting
- Teachers should follow three instructional phases:
 - Explaining the reading strategies
 - Modelling the reading strategies
 - Scaffolding the students' group work

} three core practices

Theoretical Background: Content of our Core Practice Training

„Supporting students’ self-regulated reading of scientific texts“
= domain of practice



is put into practice by the instructional activity

Reciprocal Teaching (Palincsar & Brown, 1984)



acts as container for the core practices

1) Explaining
strategies

2) Cognitive
modelling of
strategies

3) Scaffolding
of group work

Theoretical Background

How can we measure competence?

Conceptual Knowledge (cf Voss et al., 2013)

Self-Efficacy (van Dintter, Dochy, & Segers, 2011)

Professional Vision (Farrell, ... & Seidel, 2024)

Competent execution of skill (Hipp, Holstein, Kleinknecht, & Nückles, in prep.)

Hypotheses

Performance Hypothesis

Training conditions including (1) a principle-based explanation, (2) an expert modelling and (3) an opportunity to practice will foster the competent execution of core practices better than conditions lacking one of the phases

Professional Vision Hypothesis

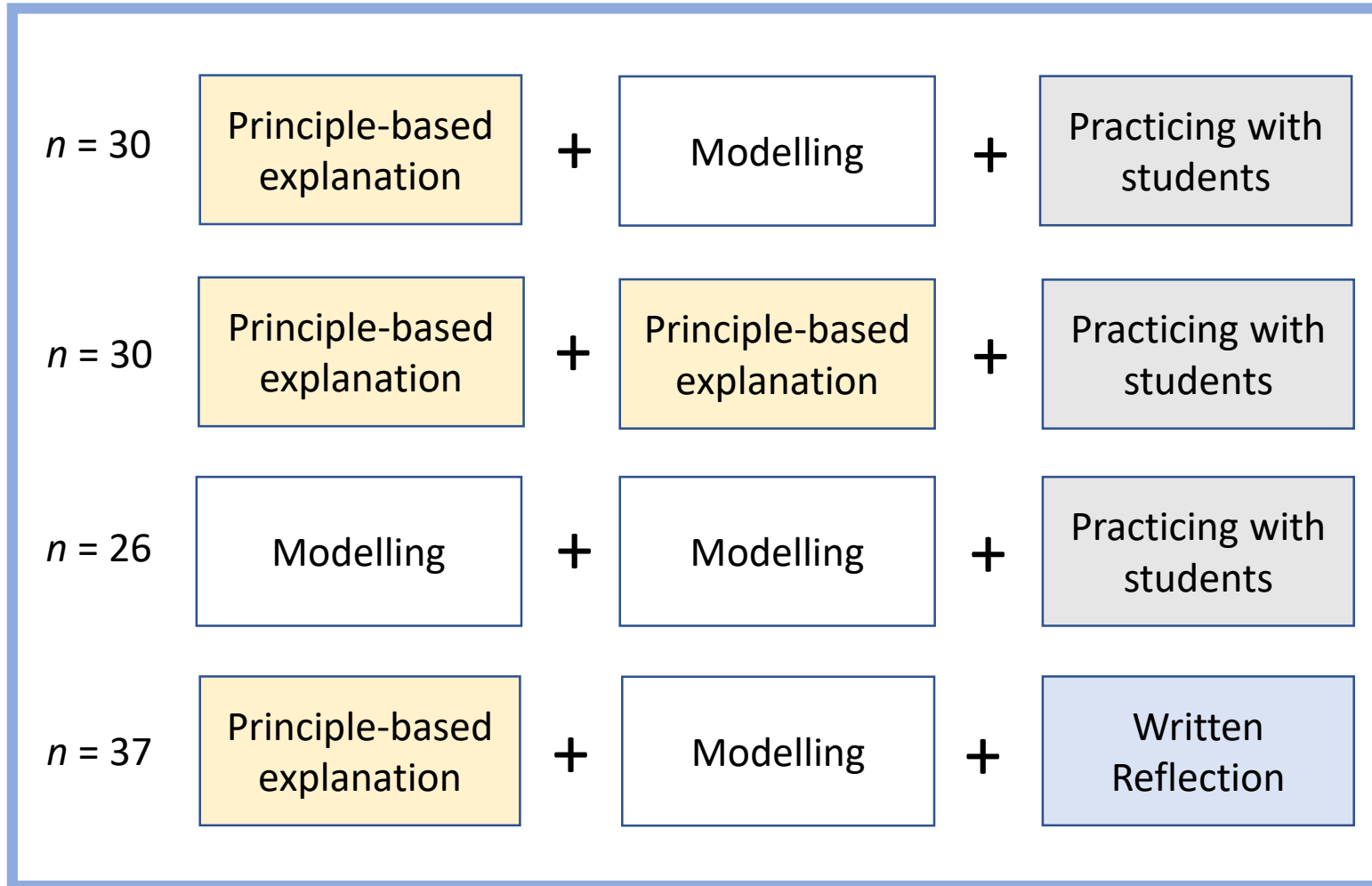
Training conditions combining (1) a principle-based explanation with (2) an expert modelling will enable a deeper understanding (professional vision) than conditions without such combination

Mediator Hypothesis

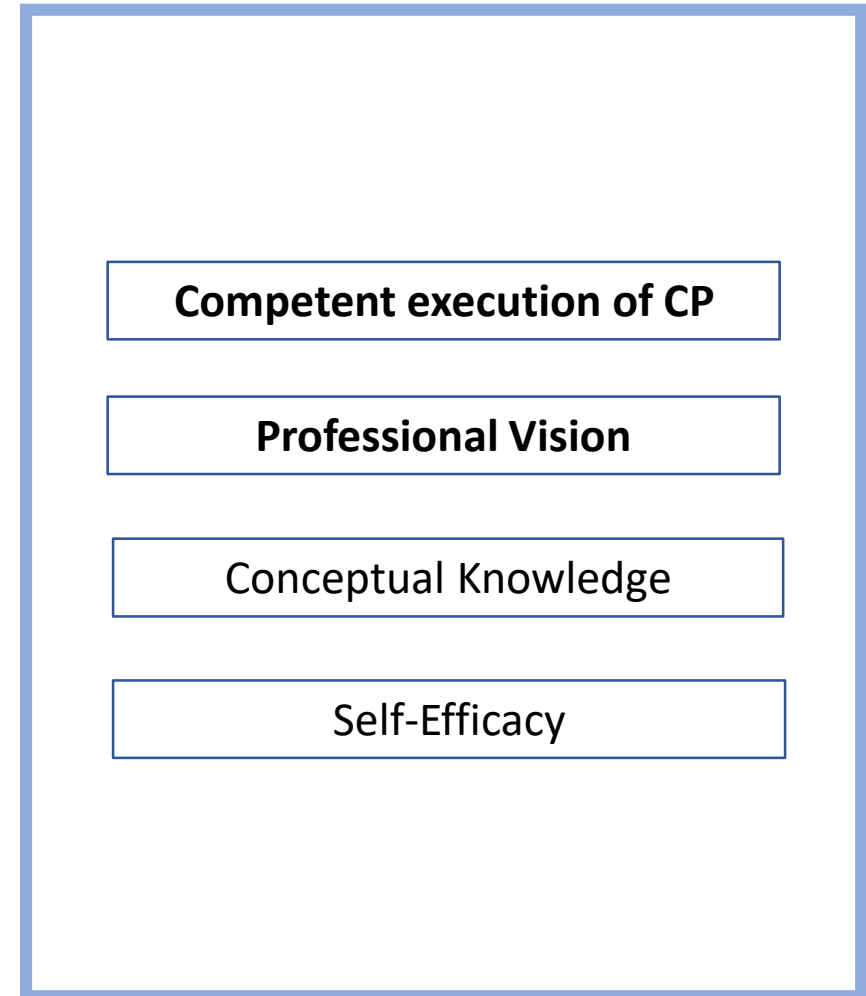
Professional vision will mediate training effects on the competent execution of core practices (Blömeke et al., 2015, Seidel & Stürmer, 2014)

Design

Week 1: Training



Week 2: Data collection



Design

Week 1: Training

Week 2: Data collection

$n = 30$

Principle-based explanation

+

Modelling

+

Practicing with students

$n = 30$

Principle-based explanation

$n = 26$

Modelling

$n = 37$

Principle-based explanation



ent execution of CP

essional Vision

eptual Knowledge

Self-Efficacy

Design

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Week 2: Data collection

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Modelling

$n = 37$

Principle-based explanation



Week 2: Data collection

Self-Efficacy

Professional Vision

Conceptual Knowledge

Self-Efficacy

Measures

- **Situational judgement test**

- Four video clips
- 30 minutes
- Cohen's $\kappa = .84$



In the video clip [...] please focus on the teacher and analyse

- a) which aspects of Reciprocal Teaching were implemented well,
- b) which aspects of Reciprocal Teaching were NOT implemented well,
- c) how the implementation of Reciprocal Teaching could be improved.

Measures

- **Semi-standardized role play** to measure ability to perform RT with students
 - Participating middle-school students were assigned small roles:
 - Difficulty finding a question and a summary (“I don’t know what to ask”)
 - Direct asking for clarification after reading (“What is...?”)
 - Giving feedback without thinking (“I liked that”)
 - **Goal:** All pre-service teachers meet similar challenges when performing Reciprocal Teaching with students



- **Video analysis:**

1. Identifying three phases of each video: explaining RT, modelling RT, scaffolding of group work

2. Segmenting and coding each phase:

- Explaining RT:

- Event-based segmentation & categorisation (see Renkl, 1997)
- Distinguishing between explanation segments conveying procedural or conditional knowledge
- Rating the quality of explanation in each segment

- Modelling RT:

- Event-based segmentation & categorisation (see Renkl, 1997)
- Rating the quality of modelled reading strategies in each segment
- Rating the realisation of cognitive modelling / “thinking aloud” in each segment

- Scaffolding of group work:

- A priori segmentation based on Clark’s (1994) psycholinguistic communication theory
- Coding proved to be more difficult than expected → coding system is currently being revised

Four-level quality rating:

0 = not realized

1 = rudimentarily realized

2 = partly realized

3 = fully realized

Measures

- **Video analysis:**

- DV “Performance” = Mean of quality scores, core practices “explaining strategies” and “modelling strategies”
- ICC: 0.7 – 0.9 (depending on CP)

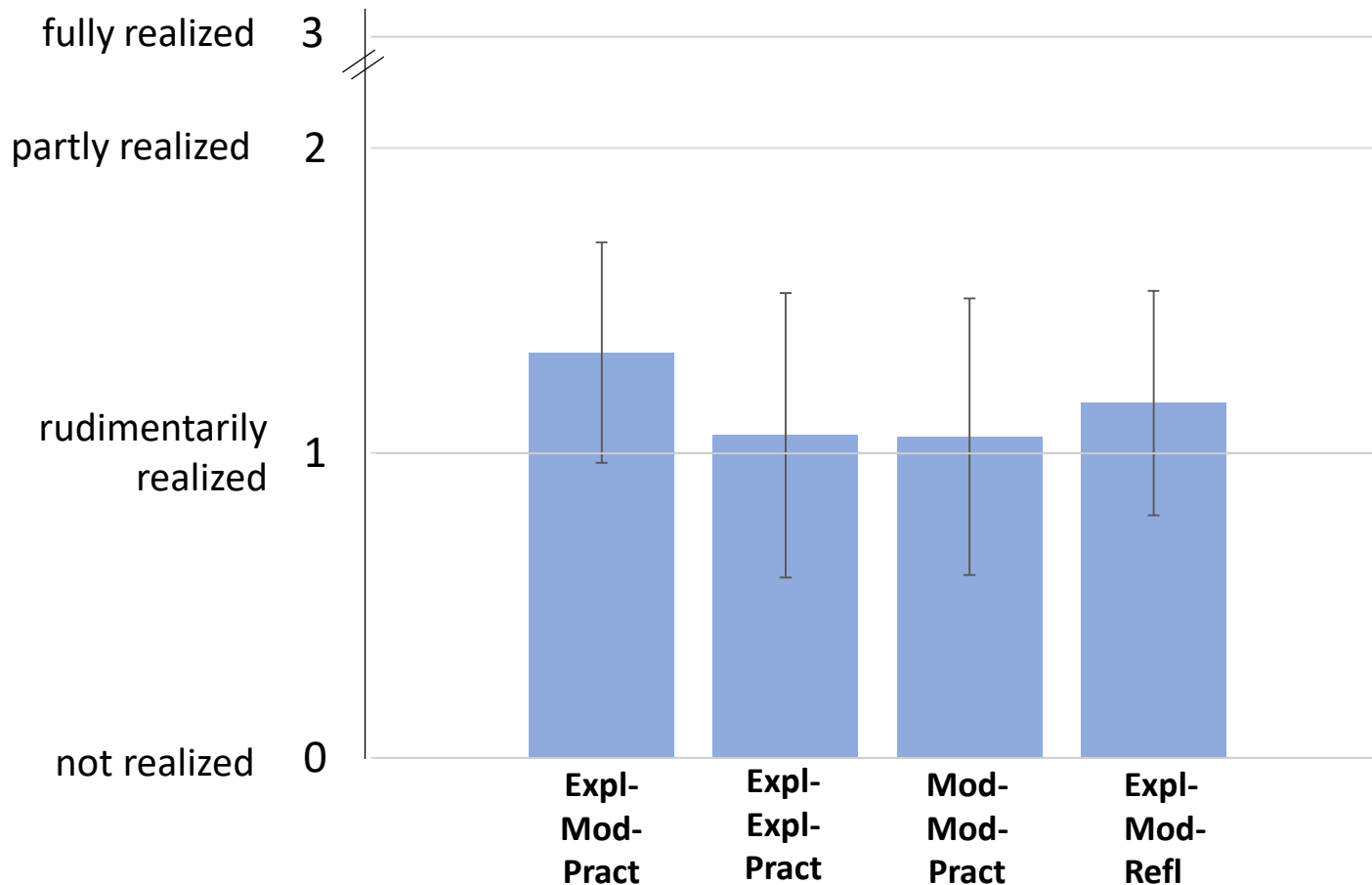
Results: Testing the Performance Hypothesis

EMP-Superiority-Contrast: 3 -1 -1 -1

$F(1, 119) = 7.53, p = .004, \eta^2 = .059$

EM-Advantage-Contrast: 1 -1 -1 1

$F(1, 119) = 6.51, p = .006, \eta^2 = .052$

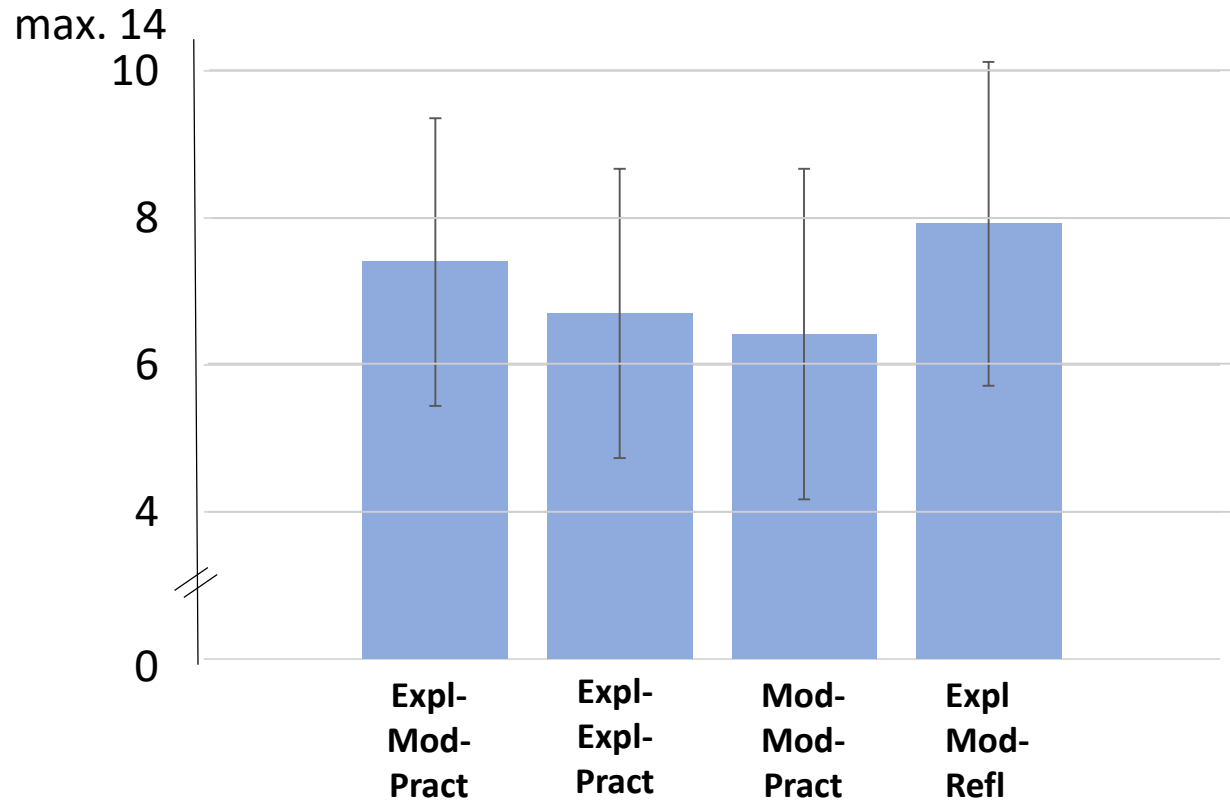


DV „Performance“ = mean of quality scores, core practices “explaining strategies” and “modelling strategies”

Results: Testing the Professional Vision Hypothesis

EM-Advantage-Contrast: 1 -1 -1 1

$F(1, 119) = 8.28, p = .003, \eta^2 = .065$

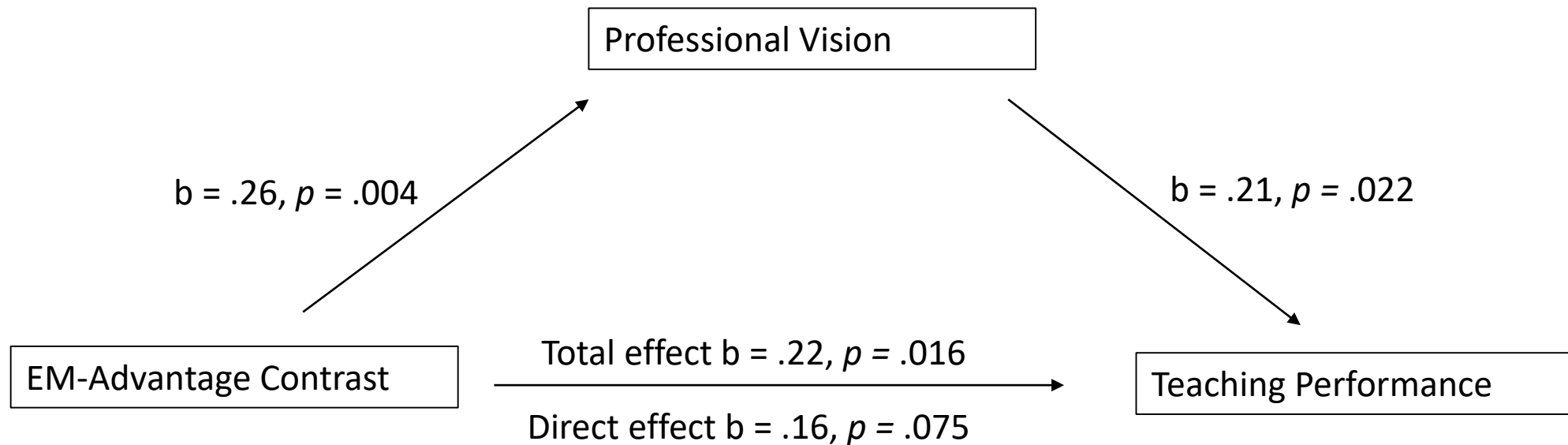


DV = performance in the professional vision test

Results: Testing the Mediator Hypothesis

Indirect effect $ab = .05$, 95% CI [.0013, .1230]

Standardized
coefficients



Discussion

Answering the “composition question”

- A combination of (1) principle-based explanation, (2) modelling and (3) practicing (E-M-P) was most effective in promoting competent teaching performance
- Conditions that combined a principle-based explanation with a modelling of RT (E-M-conditions) promoted professional vision more strongly than the other conditions
- Professional vision mediated training effects on competent teaching performance



The specific combination of abstract-scientific explanation and concrete-illustrative modelling is crucial for the design of core practice trainings that effectively promote competent teaching performance!

Discussion

- Limitations and outlook
 - Coding the core practice “scaffolding of group work” proved to be difficult due to the highly interactive nature of this core practice
 - Undergoing revision of our coding system
 - “Sequencing question” currently addressed by ongoing follow-up study
 - How does the order of training phases influence different levels of skill acquisition?

Thank you!

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