Metakognition:

Entwicklung und Einfluss auf das Lernen

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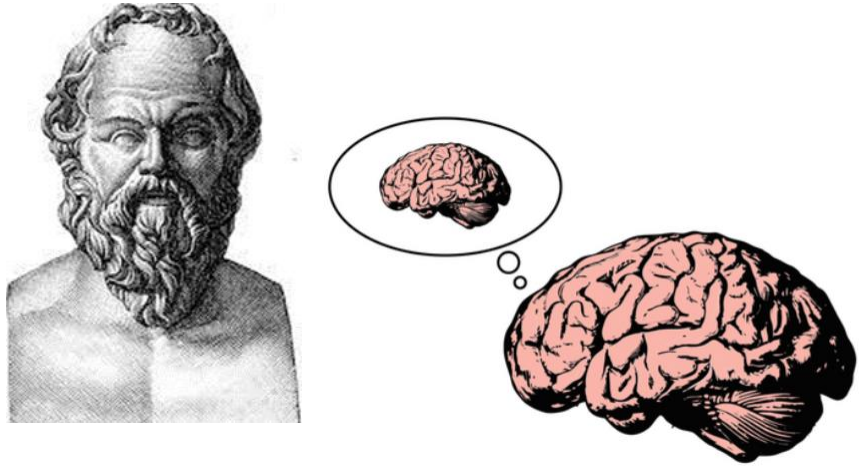
1) Was ist Metakognition?

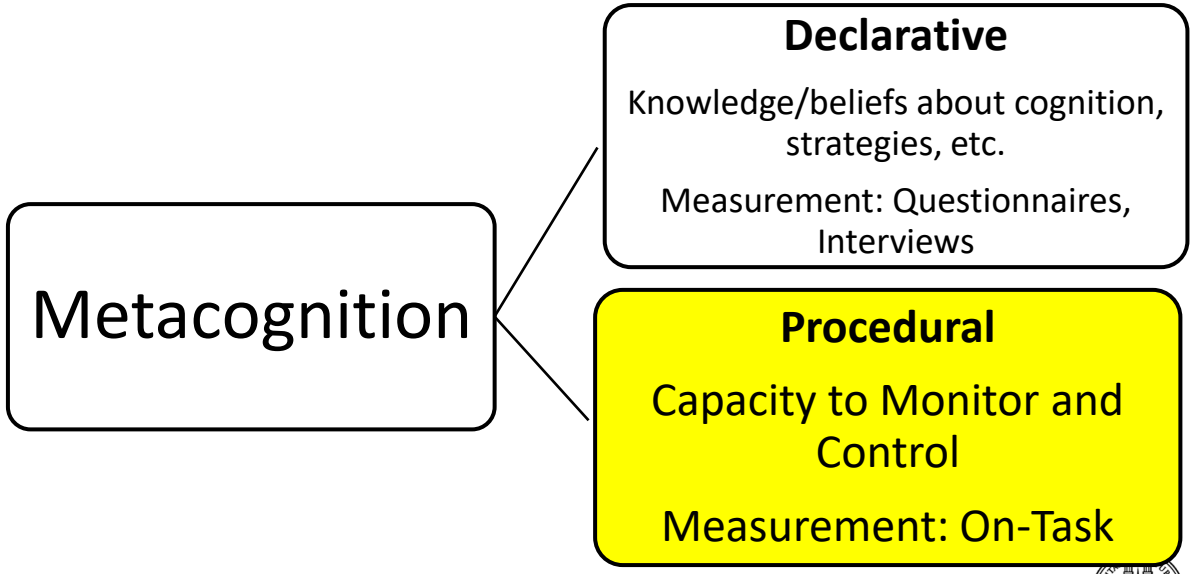
2) Wie kann man Metakognition messen?

Metakognition



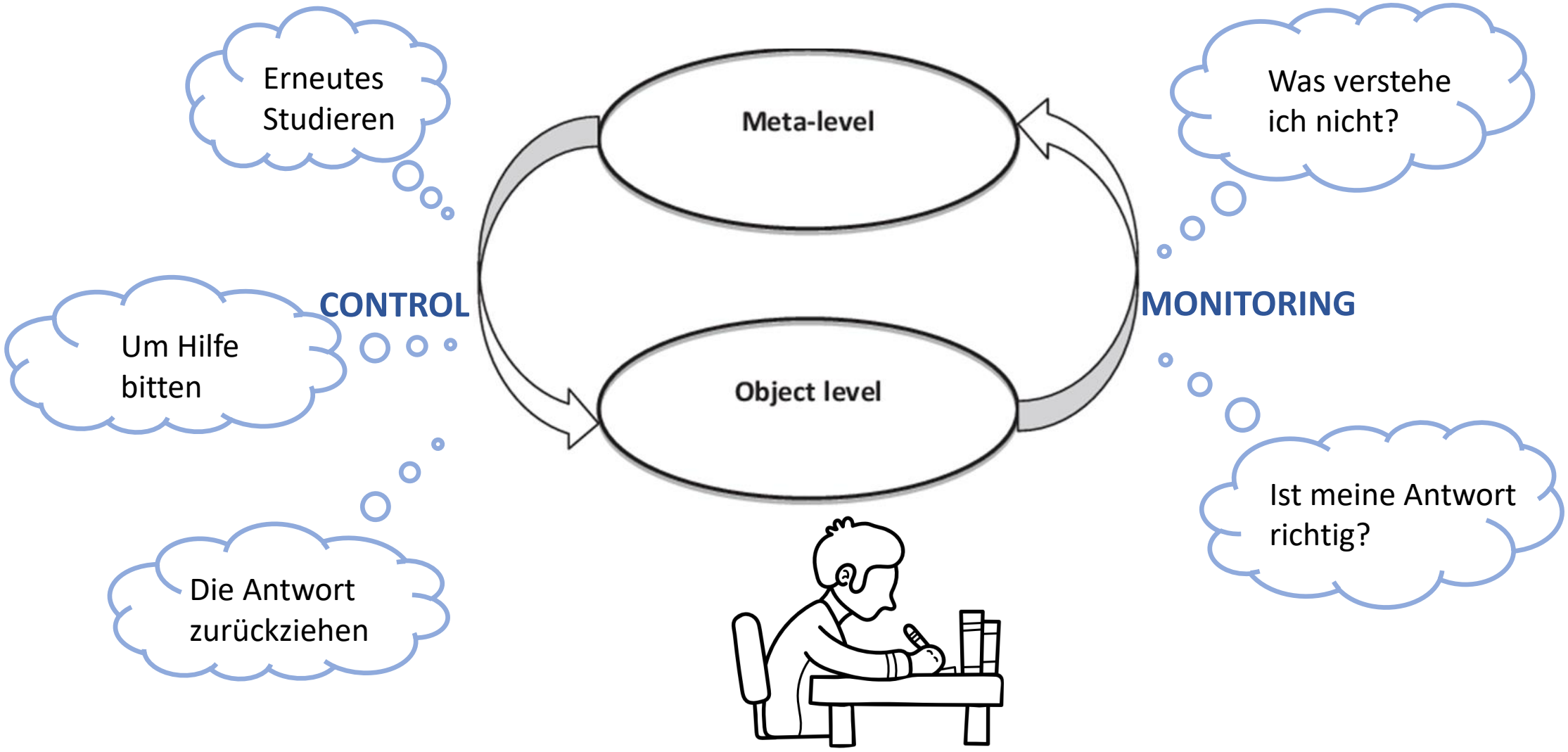
"*Selbsteinsicht ist der Weg zur Weisheit*" (Sokrates)

Metacognition - knowledge and cognition about cognitive phenomena
(Flavell, 1979)



Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive–developmental inquiry. *American Psychologist*, *34*(10), 906–11.

Procedural Metacognition (Nelson & Narens, 1990)



Nelson, T. O., & Narens, L. (1990). Metamemory: A theoretical framework and some new findings. In G. H. Bower (Ed.), The Psychology of Learning and Motivation (Vol. 26, pp. 125-173). Academic Press.

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Entwicklung der Metakognition

Selbstüberschätzung

- Für junge Kinder manchmal adaptiv → Ausdauer

Kindergarten:

- Rudimentäre metakognitive Fähigkeiten
- Entwicklung Monitoring
- Monitoring beeinflusst Suche nach Hilfe

Primarschule - Adoleszenz:

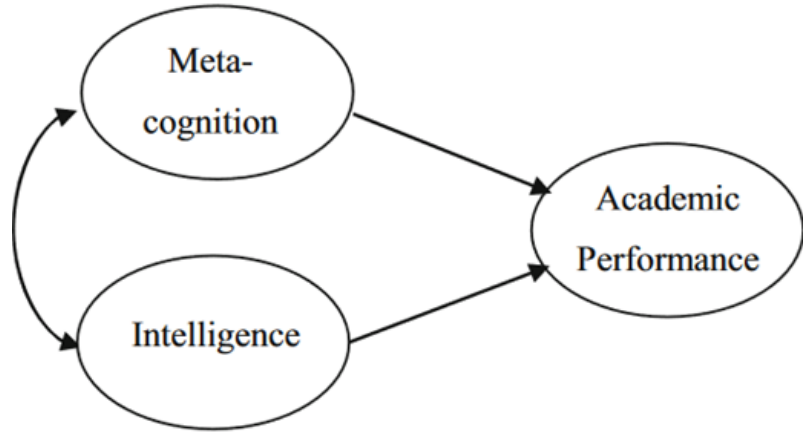
- Monitoring > Control
- Gedächtnis > Verständnis

Metakognition beeinflusst das Lernen!

- Meta-Analyse: 149 Stichproben (N = 369.047), 118 Artikel
- Declarative & Procedural Metacognition

Procedural Metacognition:

- Starke Vorhersage der Leistung (Declarative schwach)
- Korreliert mit IQ
- Stärkere Effekte als IQ auf Leistung



Ohtani, K., & Hisasaka, T. (2018). Beyond intelligence: A meta-analytic review of the relationship among metacognition, intelligence, and academic performance. *Metacognition and Learning*, 13(2), 179-212.

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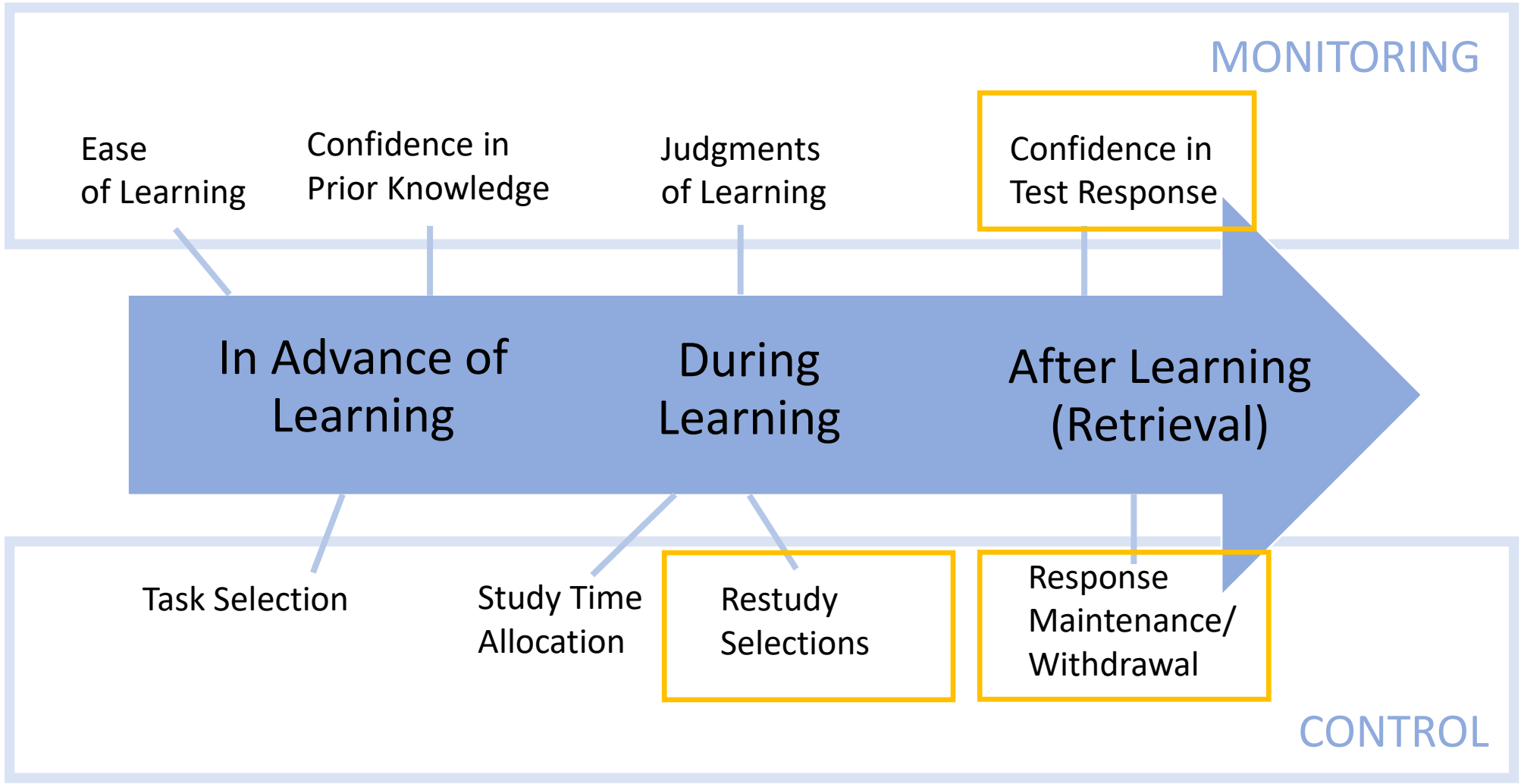
Measures of Monitoring and Control

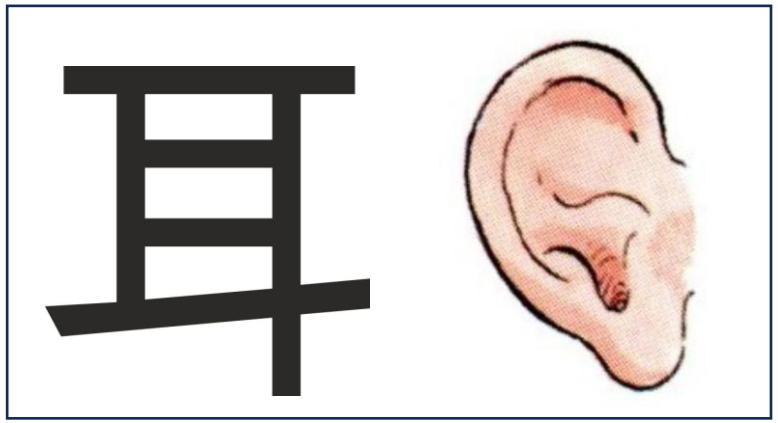


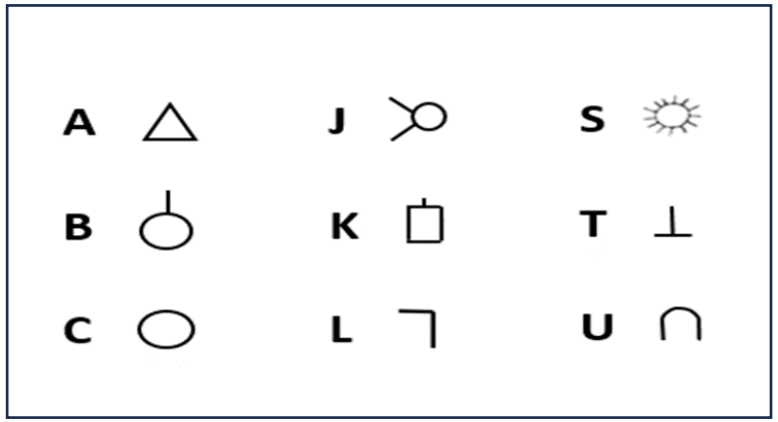
Fokus:

- Langzeitstudie: Entwicklung der Metakognition
- In der Praxis: Wie Metakognition unterstützen?

Forschungsprojekt: “Longitudinal Development of Metacognition”

- 3 Aufgaben:
  - Kanji (Recognition)
  - Texte (Verständnis)
  - Geheimschrift (Gedächtnis)





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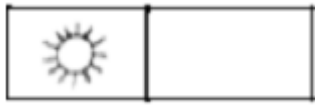
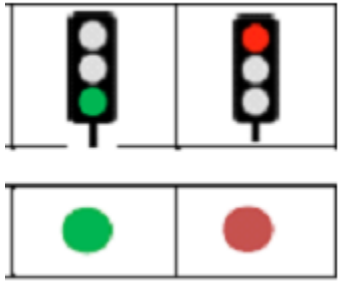
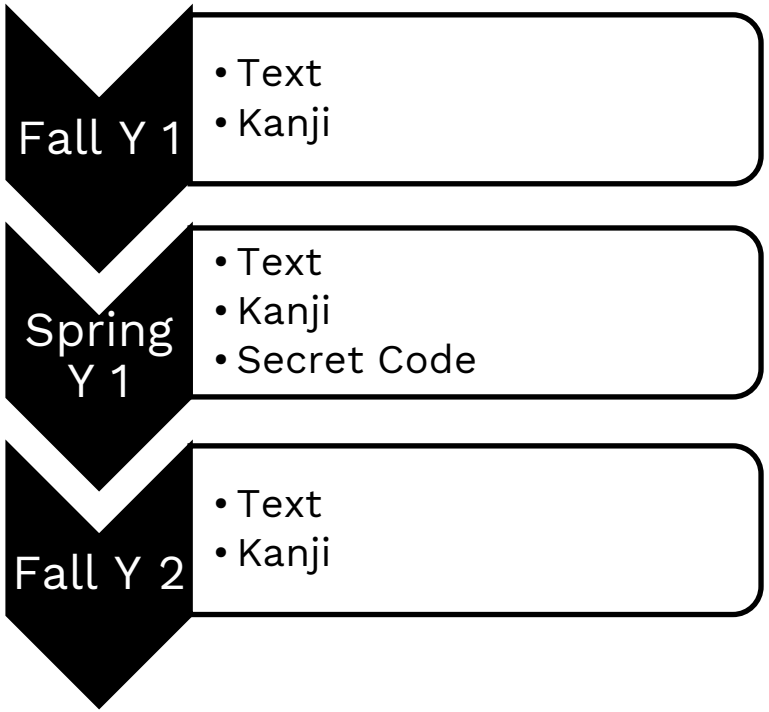
Learning Phase	Test	Monitoring	Control
Kanji Task 冬 	冬 	Very unsure — Very sure 	冬 
Text Task **Brightness of Stars** In ancient times, the scientist Hipparchus used numbers to describe the brightness of the stars. These days, scientists use the word magnitude to describe the brightness of stars. Not all stars are the same distance from earth. [.....]	Why do not all stars have the same brightness? _____ _____ Which word is used by scientists to describe the brightness of stars? _____ _____	Very unsure — Very sure  Very unsure — Very sure 	
Secret Code Task A △ D ⌓ B ○ E ⊏ C ◯ F ☼		Very unsure — Very sure 	

Project “Longitudinal Development of Monitoring and Control”



325 Teilnehmende
151 2. Klasse, *M* alter 8.12
174 4. Klasse, *M* alter 10.20

(21 Schulklassen)

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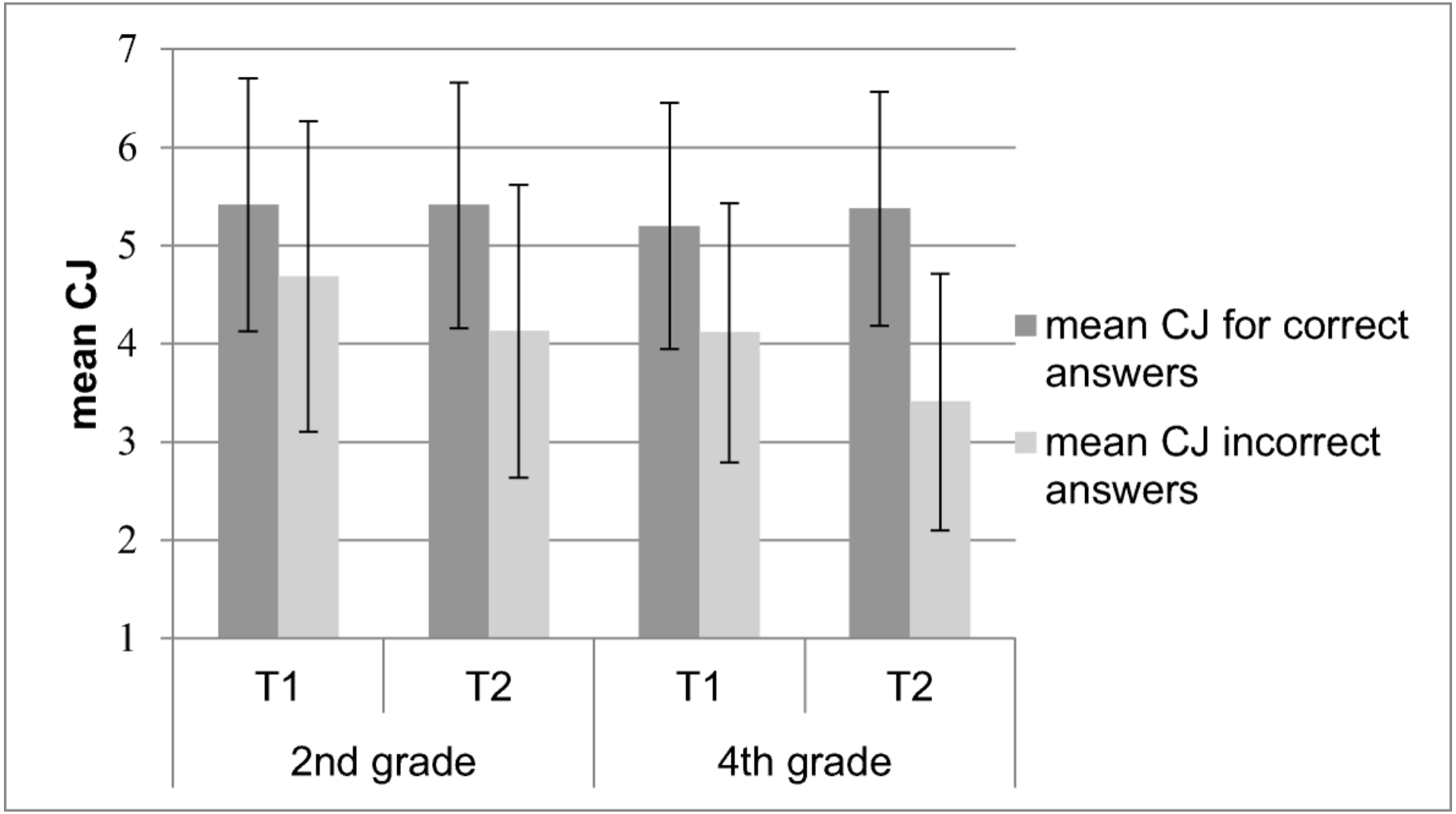
Textverständnis: Monitoring Accuracy

- Text
- Kanji

- Text
- Kanji
- Secret Code

- Text
- Kanji



Steiner, M., van Loon, M. H., Bayard, N. S., & Roebers, C. M. (2020). Development of children's monitoring and control when learning from texts: Effects of age and test format. *Metacognition and Learning*, *15*, 3-27.

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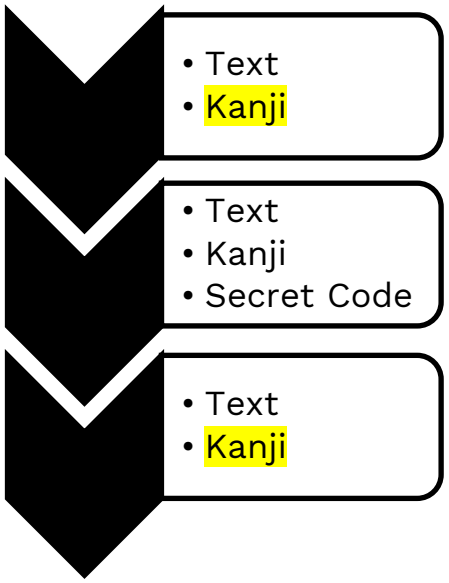
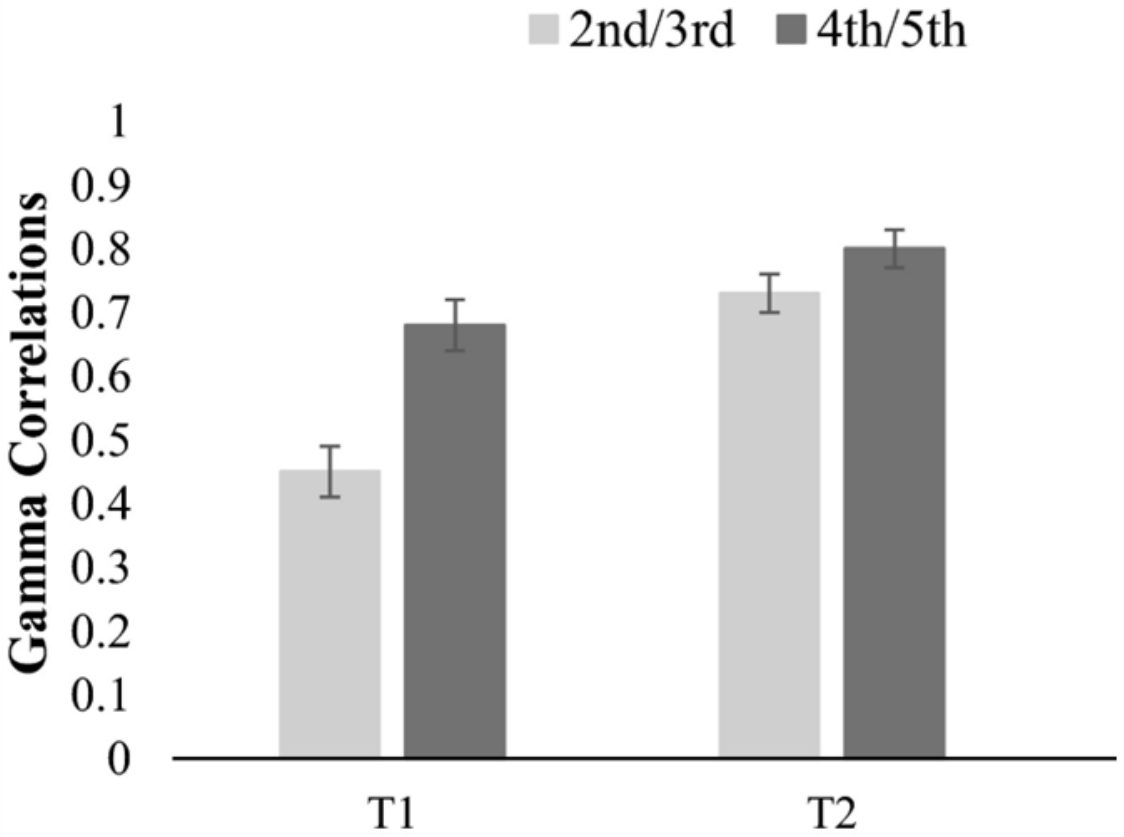
Kanji Aufgabe: Monitoring → Control



Starke Entwicklung von Monitoring-basierten Controlfähigkeiten zwischen der 2. und 3. Klasse.



Intra-individual correlations between confidence judgments and response maintenance decisions.

Bayard, N. S., van Loon, M. H., Steiner, M., & Roebers, C. M. (2021). Developmental improvements and persisting difficulties in children's metacognitive monitoring and control skills: Cross-sectional and longitudinal perspectives. *Child Development*, *92*(3), 1118-1136.

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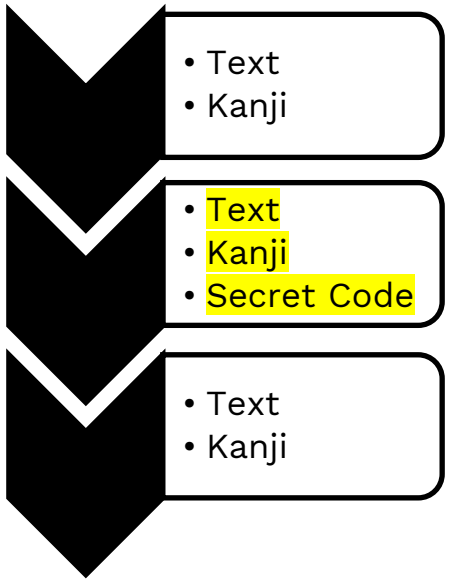
Metakognitive Fähigkeiten “Generalisierbar”?



Konfirmatorische Faktorenanalyse

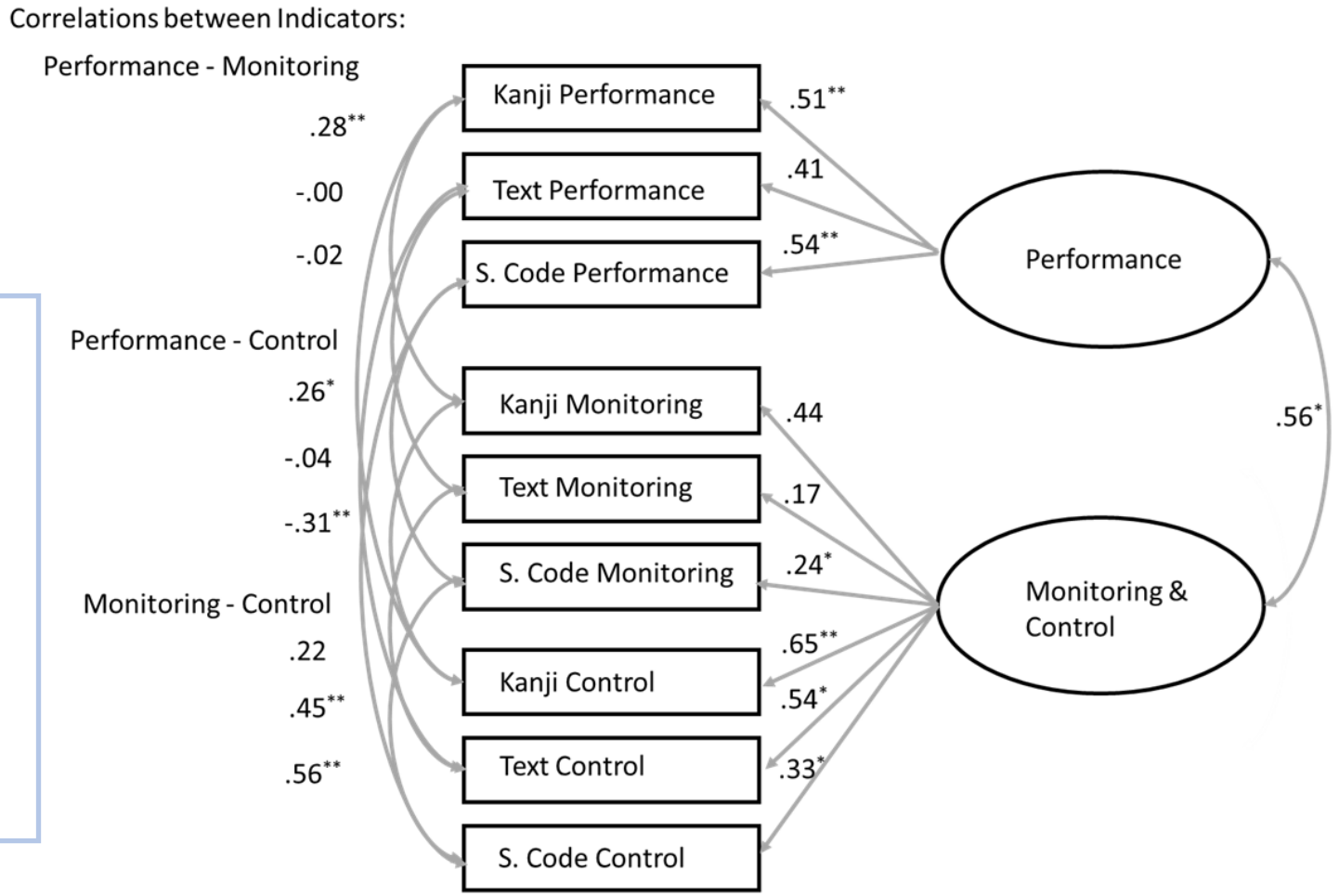
Faktorstruktur Metakognition

- Laden Indikatoren verschiedener Aufgaben auf denselben Faktor?
- Testen und Vergleichen verschiedener Modelle

Metakognitive Fähigkeiten “generalisierbar”?

Monitoring und Control für 3 Aufgaben laden auf einen Metakognitionsfaktor
→ **Generalisierbare Fähigkeit**

Trennbar von Leistung



Van Loon, M.H., Orth, U., & Roebers, C.M. (2024). The structure of metacognition in middle childhood: Evidence for a unitary metacognition-for-memory factor. *Journal of Experimental Child Psychology*, https://doi.org/10.1016/j.jecp.2023.105857.

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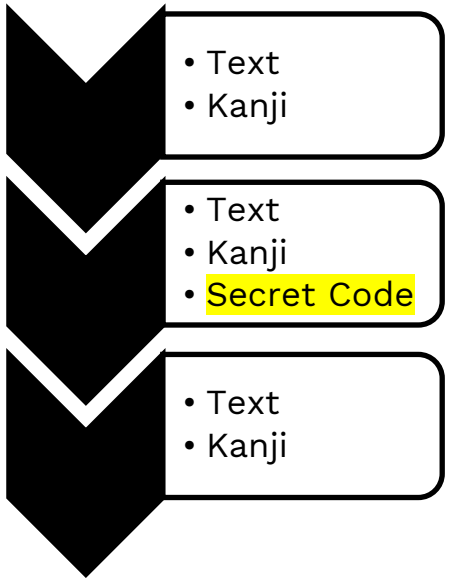
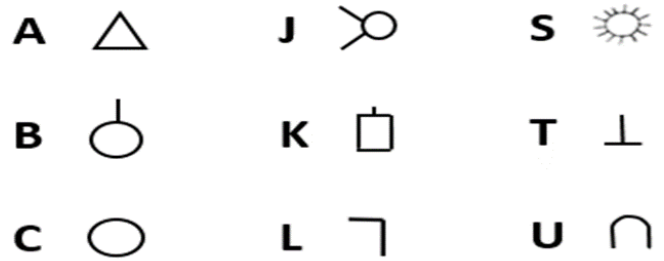
Sprache der Lehrperson beeinflusst Metakognition



21 Lehrpersonen unterrichten Geheimschrift

- Lehreraussagen aufgezeichnet (Audio)

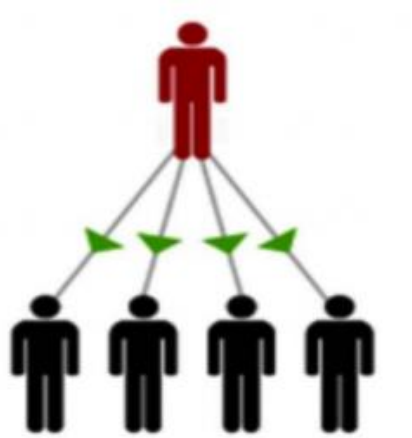


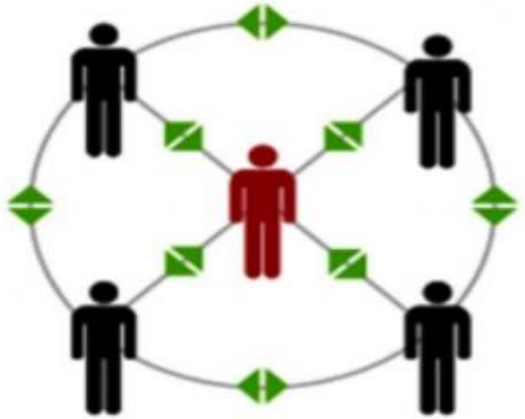
Kodierung:

- Strategie-Unterricht
- Wie? teacher-directed vs child-centered

Child-Centered Unterricht:

- ➢ Genaueres monitoring
- ➢ Effektiveres restudy





Van Loon, M. H., Bayard, N. S., Steiner, M., & Roebers, C. M. (2021). Connecting teachers' classroom instructions with children's metacognition and learning in elementary school. *Metacognition and Learning*, *16*, 623-650.

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Zusammengefasst

- Entwicklung der Metakognition
  - Monitoring
  - Control
  - Monitoring-based-control
- Entwicklung: Adaptiv/at-risk?
  - 10% at-risk! Braucht Aufmerksamkeit (Ursachen? Komorbidität Lernstörungen?)
- Metakognition kann man unterrichten

Monitoring unterstützen im Kindergarten: Feedback

105 Kindergartenkinder, *M* alter 5.8

Reasoning tasks (6)
Antwort + Monitoring

Feedback Experiment:
- kein Feedback
- Leistungsfeedback
- Monitoring Feedback

Monitoring
"Antwort richtig oder falsch?"

Van Loon, M. H., & Roebers, C. M. (2020). Using feedback to improve monitoring judgment accuracy in kindergarten children. *Early Childhood Research Quarterly*, *53*, 301-313.

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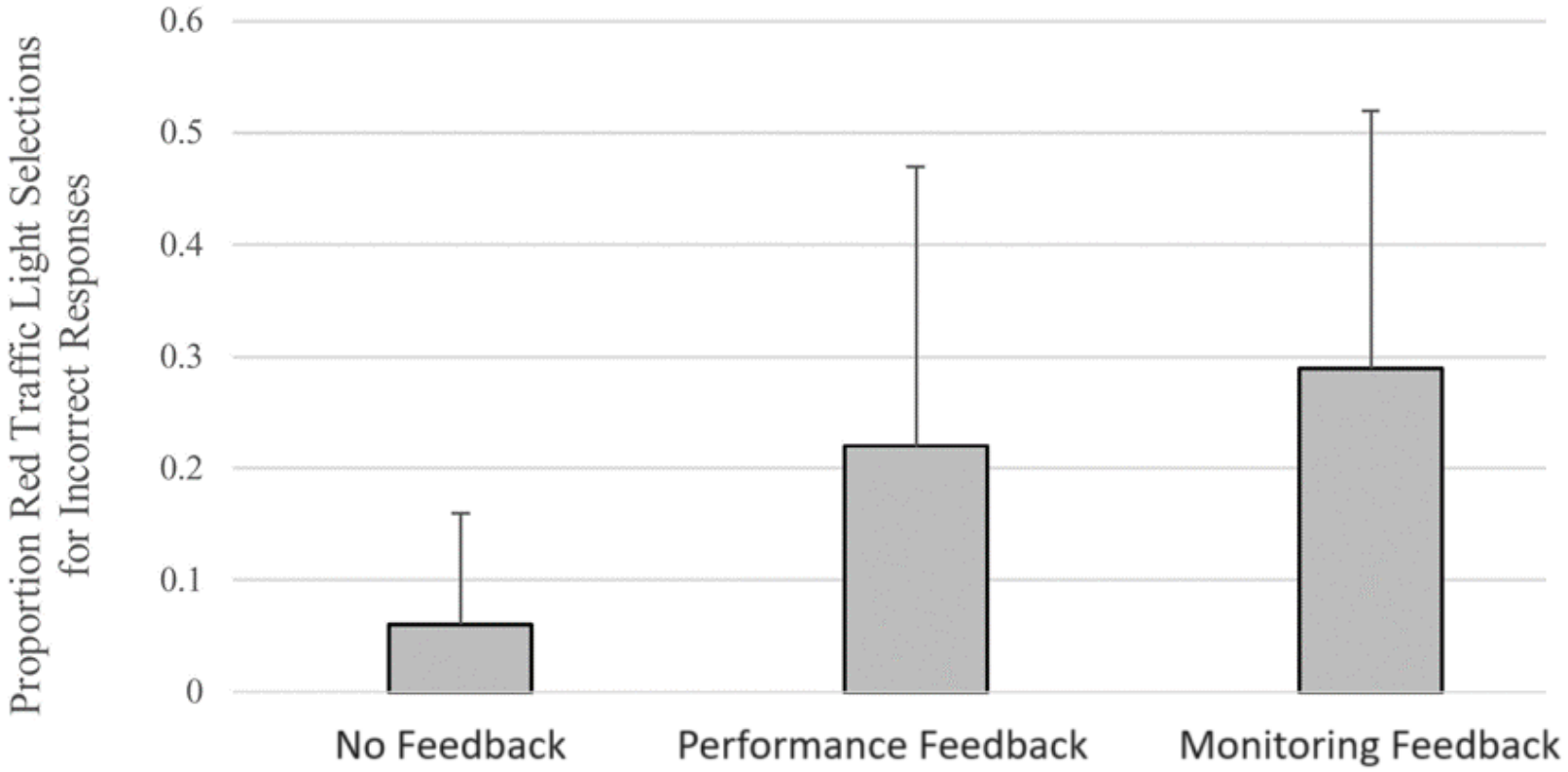
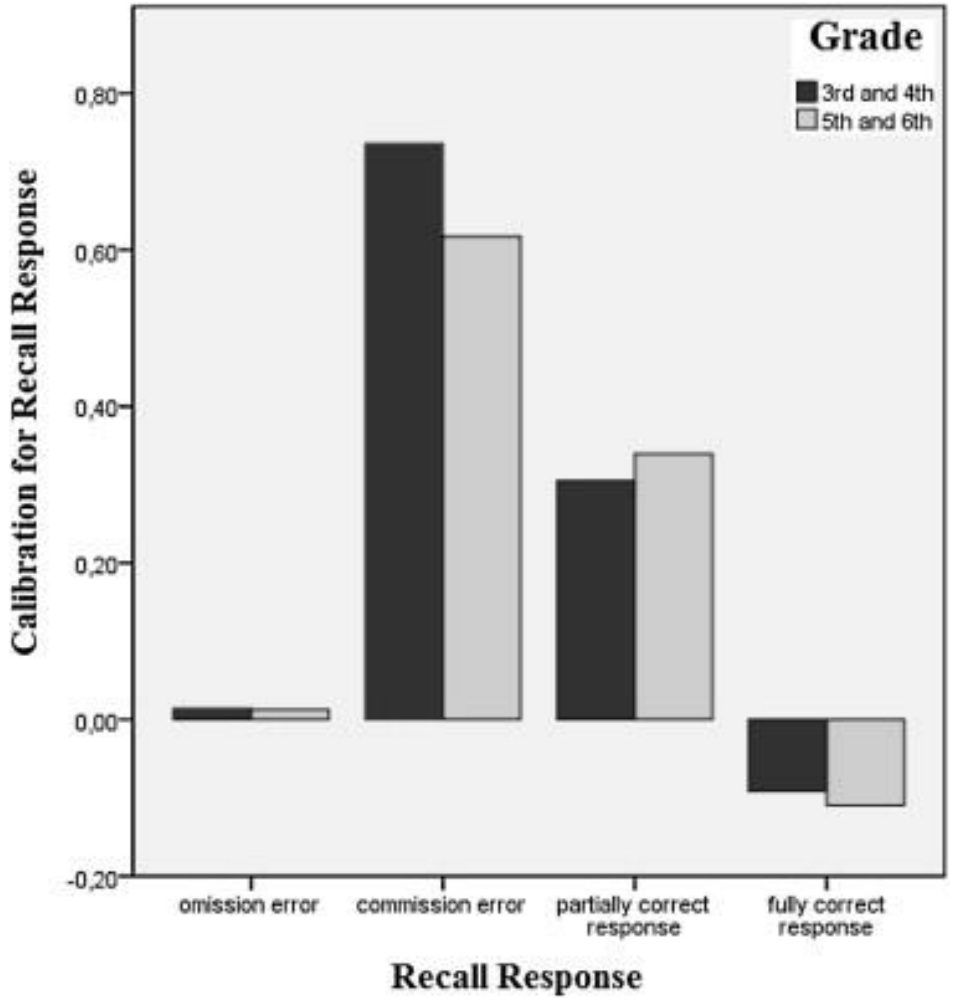
Feedback verbessert Fehlererkennung



Van Loon, M. H., & Roebers, C. M. (2020). Using feedback to improve monitoring judgment accuracy in kindergarten children. *Early Childhood Research Quarterly*, *53*, 301-313.

Primarschule: Selbstüberschätzung bei Fehlern (Commission Errors)



Van Loon, M. H., de Bruin, A. B., van Gog, T., & van Merriënboer, J. J. (2013). Activation of inaccurate prior knowledge affects primary-school students' metacognitive judgments and calibration. *Learning and Instruction, 24*, 15-25.

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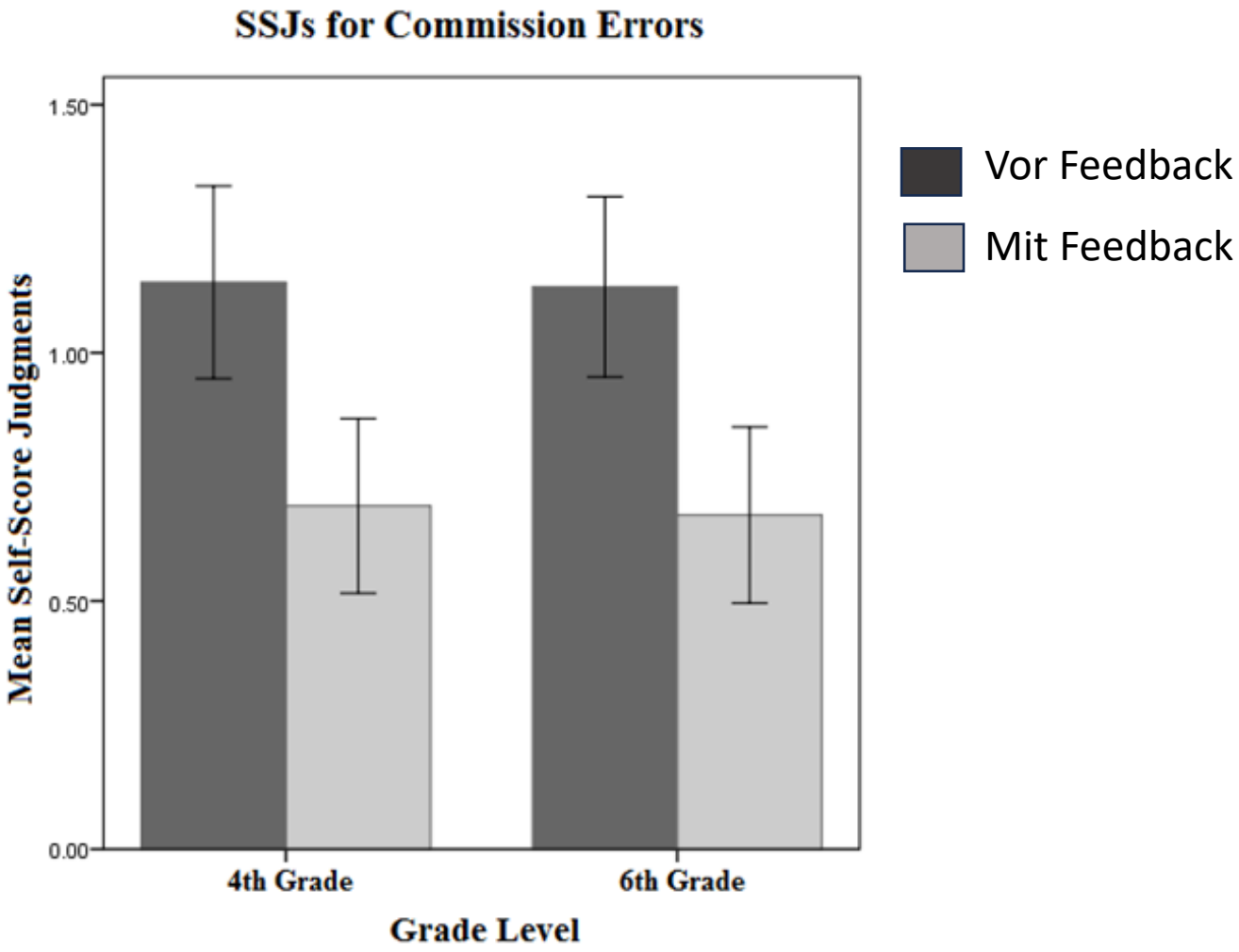
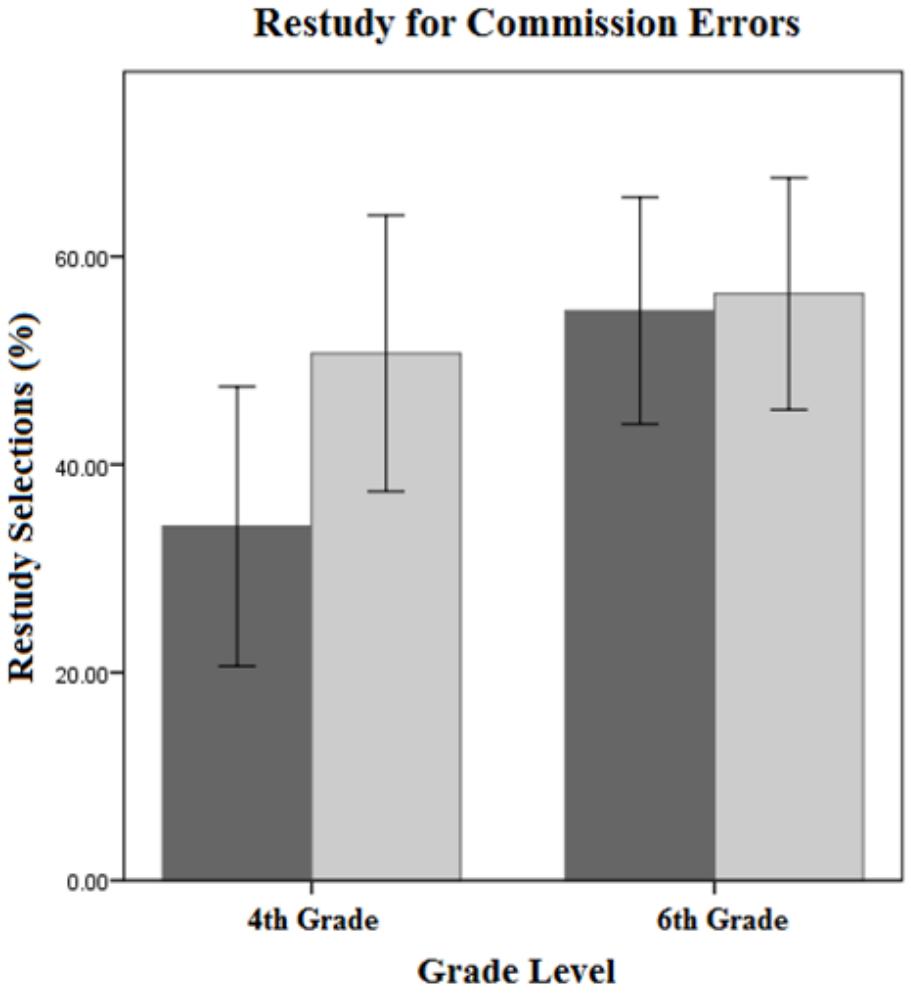
Feedback: Vergleich mit den richtigen Antworten



Vor Feedback

Mit Feedback



Van Loon, M. H., & Roebers, C. M. (2017). Effects of feedback on self-evaluations and self-regulation in elementary school. Applied Cognitive Psychology, 31(5), 508-519.

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Lernen komplexer Texte (9. Klasse)
Wie Metakognition unterstützen?

Water pollution

Water pollution is the contamination of water bodies. It occurs when pollutants (such as heavy metals or persistent organic pollutants) are discharged into water. Water pollution affects plants and organisms in these bodies of water. The pollution can be damaging to individual species and populations. Toxins climb the food chain after small fish consume pollutants, then the large fish eat the smaller fish. Each successive step in the food chain causes a stepwise concentration of pollutants.

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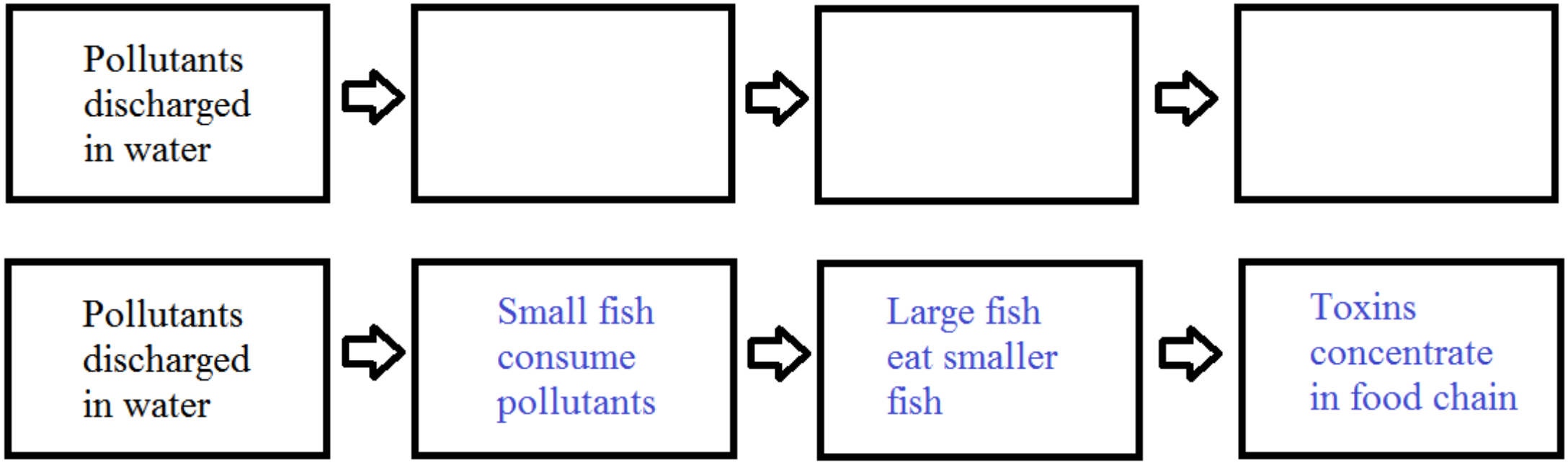
Lernen komplexer Texte.
Wie Metakognition unterstützen?



Experiment: Immediate Diagrams vs. Delayed Diagrams

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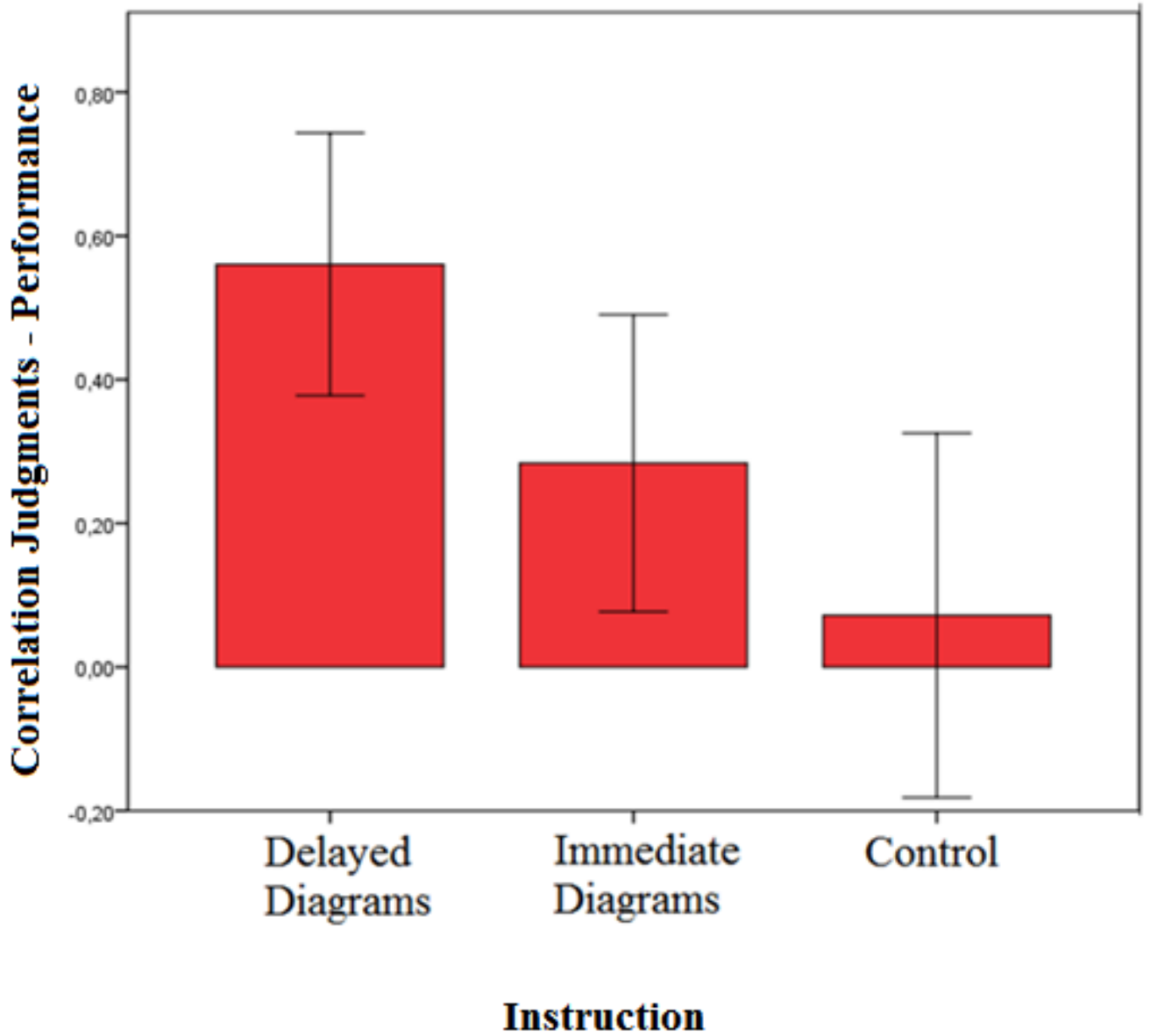

Van Loon, M. H., de Bruin, A. B., van Gog, T., van Merriënboer, J. J., & Dunlosky, J. (2014). Can students evaluate their understanding of cause-and-effect relations? The effects of diagram completion on monitoring accuracy. Acta Psychologica, 151, 143-154.

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Fazit:

- Monitoring ungenau → Fehler nicht erkennen/korrigieren
- Metakognition entwickelt sich nicht „automatisch“
- Monitoring macht nur Sinn, wenn es Möglichkeiten gibt, dies in Control umzusetzen
- Selbstmonitoring – und Controlmöglichkeiten, nicht nur Leistungsfokus
- Feedback
  - Von Lehrpersonen
  - Selbstkontrolle/Selbstfeedback in der Lernaufgabe
    - Vergleich mit Standard
    - Diagram ausfüllen

Thank you
Danke
Merci
Dankjewel

Wir suchen 7. Klassen – Forschungsprojekt “Metakognitive Entwicklung”

Webseite:
https://www.psychologie.uzh.ch/de/bereiche/dev/metakog/studienteilnahme.html

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