Intermittent signals as prompts for coherence formation and the role of learners' prior knowledge

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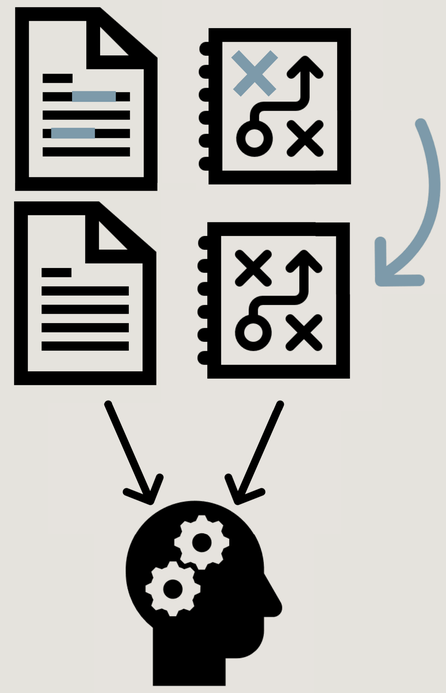
Theoretical Background

- For a successful learning process a learner has to integrate different representations into a coherent mental representation (Mayer, 2014)
- Signals could support the learner during this process, and therefore improve the learning outcomes (Richter, Scheiter, & Eitel, 2016)
- Signals might function as prompts which trigger a deeper learning process (Bannert, 2009)
- A learner needs at least some prior knowledge to handle the signals in a helpful way (Seufert, 2003)



How can intermittent signals affect learning?

- In contrast to continuous signals, the absence of signals could function as a desirable difficulty which could enhance the mental effort resulting in a higher learning outcome (Bjork, 1994)
- As a carry-over effect, the deeper processing triggered by prompts might also be conducted when signals are no longer available
- Learners who have to identify and link correspondences without the assistance of signals need additional resources
- Thus, facing these higher demands on learners the question arises of whether intermittent signals still have positive effects on learning and whether these effects depend on prior knowledge

Research Question

Do intermittent signals have a positive effect on learning and which role does prior knowledge thereby play?

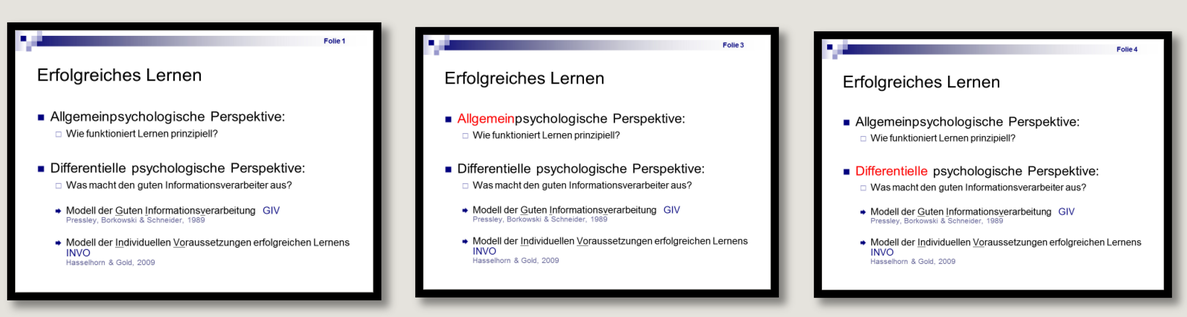
Hypotheses

We assume an overall positive effect of intermittent signals

We assume that particularly learners with high prior knowledge can profit from intermittent signals

Method and Design

- N = 102 (M_{age} = 21.32, SD_{age} = 2.57; 88.5 % female)
- Experimental factors
  - presence of signals (without / intermittent)
    Intermittent signals of the most relevant words or picture parts on the slides were highlighted intermittently in the first and third quarter of the lecture (12 of 27 slides)
  - learners' prior knowledge
- Dependent variable: learning outcomes
- Implemented in an online lecture for psychology students



Results

- Signals were not a significant predictor for learning outcomes
  (β = -.22, t(101) = -1.04, ns)
- The interaction (signals x prior knowledge) was a significant predictor for learning outcomes
  (β = -.39, t(101) = 0.39, p = .05)

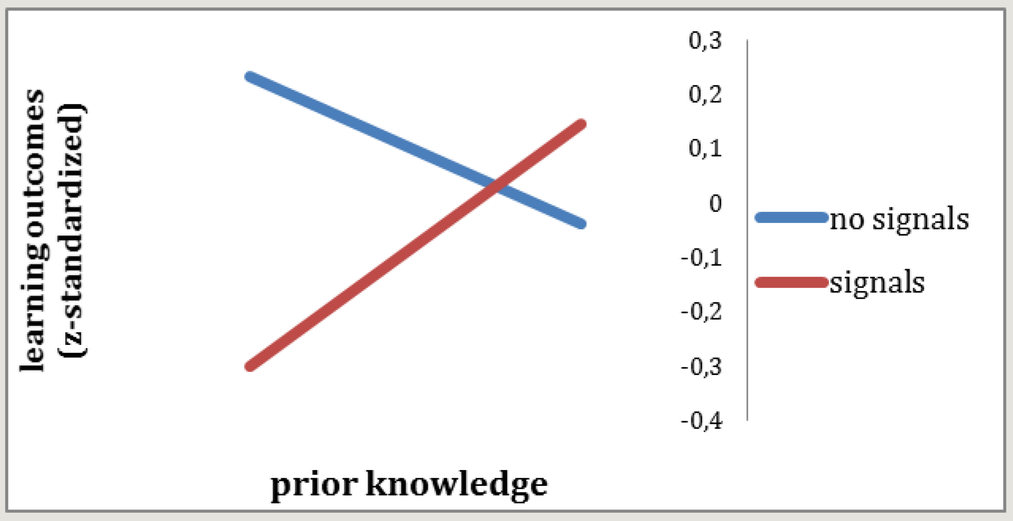


Figure 1. Interaction effect of signals and prior knowledge (continuous, z-standardized) on learning outcomes (z-standardized).

- In the condition with signals, prior knowledge seems to affect learning outcomes
  (β = -.26, t(101) = 1.56, p = .06)

Conclusions

- Effective use of help requires additional resources
- Thus, for designing learning substantiate, resource-related learner characteristics such as prior knowledge, working memory capacity or other cognitive skills should be taken into account
- Further studies should additionally include a group with enduring signals and should analyze cognitive load to support our interpretation

References

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