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# Content-specific teaching practices to enhance learners' concise language use while dealing with amount and change

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## Content-specific teaching practices to increase conciseness

In their research survey on language-responsive approaches, Erath et al., (2021) observe that so far, planning and interaction dimensions of scaffolding have been investigated separately and call for investigating the mutual relationship: “Future research should strengthen the efforts to combine the analysis of dimensions that have formerly been researched separately” (p. 258). In particular, little is known about how macro-scaffolding is supported by micro-scaffolding strategies as Pöhler (2018) outlined while addressing this question to some extent by investigating the impact of micro-scaffolding prompts on intended teaching-learning processes. Even if a few studies already show that students' language development can be enriched by teaching practices (e.g., Smit et al., 2013), further studies are requested (Erath et al., 2021).

One part of my PhD thesis will contribute to reducing this research gap by showing the impact of spontaneous support through adaptive micro-scaffolding practices on students' language use while dealing with amount and change and their relationship.

In previous empirical studies we have already shown that conceptual challenges in dealing with amount and change, e.g., confusing the levels  $f, f', f''$  (Nemirovsky & Rubin, 1992), can be overcome successfully when a concise meaning-related language is developed (Prediger and Şahin-Gür (2020) differentiated conciseness topic-specifically into explicitness of level references and preciseness of change process comparisons). In addition, we have observed that teachers' prompts for making references explicit are crucial for developing conciseness of language. These have given us important hints for the further development of the teaching-learning arrangement. At the same time these insights emphasize the need to provide opportunities for enhancing students' explicit and concise language while dealing with deep mathematical concepts such as amount and change.

So far much is known about students' processes of extending their individual lexicon, but too little is known about explication and preciseness and even less is known about the effective support of more and more explicit and precise language expansion. This allows me to present a poster sketching the research on the following research questions:

*What teaching practices repeatedly emerge in relation to learners' increasing explicitness of language use while dealing with amount and change? And how are these teaching practices related to varying degrees of explicitness and particular concepts of amount and change?*

## Methods

**Data collection.** The data collection for the complete PhD study comprised design experiments with 16 pairs of 10 and 11<sup>th</sup> graders (14-16 years old), and the author as the design experiment leader. The

research reported in the poster focuses on data from design experiments in laboratory settings with nine pairs of 11<sup>th</sup> graders. Two sessions of 45-60 minutes each were completely video-recorded for each pair (around 1000 minutes of video material).

**Data analysis.** In order to analyze the connection between teachers' practices and students' topic-specific explicitness and preciseness of their language use, the qualitative data analysis proceeds in three steps needs to coordinate two theory-driven deductive codings:

*Step 1.* Locating students' and teachers' utterances in the topic-specific degree model for conceptual conciseness (explicitness and preciseness) (Prediger & Şahin-Gür, 2020)

*Step 2.* Depicting the chain of utterances (Prediger et al., 2020), marking and connecting the pathways

*Step 3.* Based on these coordinated, theory-driven codings, the teachers' questions and prompts are coded and typical recurring practices are identified in sequences or questions and prompts, following the analytic procedure suggested by Prediger et al. (2020).

## Conclusion

The necessity to elaborate vague student language has already been identified in other transcripts from qualitative calculus (Prediger & Şahin-Gür, 2020). The poster will reveal first content-specific insights on what is crucial to pick up and connect in students' thinking (e.g., identifying and explicating the levels) by identifying relevant teaching practices.

**Outlook for the physical poster.** The poster will list in bullet points the theoretical approaches and show the research question. I would like to spend a large part of the poster on empirical findings, illustrated in an exemplary transcript and the related analytic scheme of the identified practices.

## References

- Erath, K., Ingram, J., Moschkovich, J., & Prediger, S. (2021). Designing and enacting instruction that enhances language for mathematics learning: a review of the state of development and research. *ZDM – Mathematics Education*, 53(2), 317–335. <https://doi.org/10.1007/s11858-020-01213-2>
- Nemirovsky, R., & Rubin, A. (1992). Students' Tendency to Assume Resemblances between a Function and Its Derivative. *TERC Working Paper*, 2-92. Cambridge: TERC Communications.
- Pöhler, B. (2018). *Konzeptuelle und lexikalische Lernpfade und Lernwege zu Prozenten: Eine Entwicklungsforschungsstudie* [Conceptual and lexical learning trajectories and learning pathways for percentages]. Heidelberg: Springer Spektrum. (*PhD thesis*)
- Prediger, S., & Şahin-Gür, D. (2020). Eleventh graders' increasingly elaborate language use for disentangling amount and change – A case study on the epistemic role of syntactical language complexity. *Journal für Mathematikdidaktik*, 41(1), 43-79. doi:10.1007/s13138-019-00155-x
- Prediger, S., Quabeck, K., & Erath, K. (in press). Conceptualizing micro-adaptive teaching practices in content-specific ways: A case study on comparing fractions. Submitted manuscript.
- Smit, J., van Eerde, D. H. A. A., & Bakker, A. (2013). A conceptualization of whole-class scaffolding. *British Educational Research Journal*, 39(5), 817–834. <https://doi.org/10.1002/berj.3007>