

# Professional competences of future mathematics teachers concerning the role of language in mathematics teaching

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## Introduction

The current PhD-study is part of the state funded project 'Professional teaching practice to promote subject-related learning under changing social conditions' (Profale). Goals are amongst others (regarding mathematics education):

- to promote future mathematics teacher's noticing of language barriers within mathematical learning processes.
- to promote professional competence in helping students to tackle these learning barriers.

**Overall aim:** to develop, evaluate and implement university courses, which integrate aspects of language learning into mathematics education.

## Theoretical background

- There exists a relation between the first language, language proficiency and the mathematical performance of students (PISA, TIMSS, etc.).
- In mathematics classes different **language registers** (Halliday, 1978) are needed and used: **everyday language**, **mathematical language** and a language register described by Gogolin as academic language (so-called 'Bildungssprache').
- '**Bildungssprache**' comprise language skills at word, sentence, text and discourse level to decode and communicate abstract and complex contents (Gogolin & Duarte, 2016).
- Language has a **communicative and cognitive function** for learning and doing mathematics (Maier & Schweiger, 1999).
- Although teachers should **promote language skills** according to the German national standards, language is seldom addressed explicitly in ordinary classroom activities (Schütte & Kaiser, 2011).
- **Beliefs** comprise affect and cognition and influence teaching practice at school as well as future teachers' learning at university (Schwarz, 2013).

## Research questions

Which beliefs about the role of language for learning and teaching mathematics do future teachers hold?

Which aspects of language in learning and teaching mathematics do prospective mathematics teachers notice and how do they react in specific situations?

Which relations exist concerning the awareness of the role of language in mathematics learning and teaching before and after an intervention?

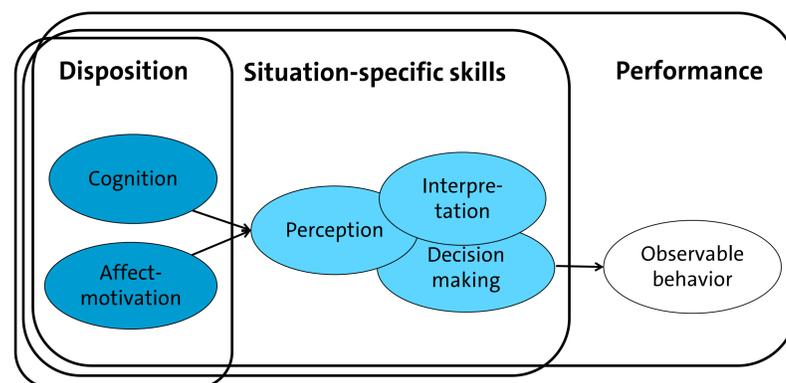


Figure 1: Modelling competence as a continuum (Blömeke et al., 2015)

## Design of the study

Main testing instrument: structured interviews about the role of language for learning and teaching mathematics  
structured interviews about a videotaped situation in mathematics classroom

10/2016

10/2016 – 02/2017

03/2017 - 04/2017

04/2017 – 10/2017

10/2017 - 11/2017

Pre-test G1

Pre-test G2

### Seminar A (1<sup>st</sup> Semester, Master)

- Refers completely to the role of language in learning and teaching mathematics
- Analyses mathematical tasks and vignettes displaying mathematical solution processes regarding different language registers and (potential) language barriers
- Theories of language acquisition
- Learning opportunities concerning *Scaffolding* (Gibbons, 2002), e.g. analysing the needed language skills for a specific topic

Learning diary

Post-test G1

Pre-/Post-test G2

Pre-test G3

### Seminar B (2<sup>nd</sup> Semester, Master)

- Accompanies the school internship => more general about mathematics education and pedagogical aspects, but continuously considering language and its learning
- Reflection of own or joint classroom observations

Written documentation of focused observation tasks during school internship

Post-test G2

Post-test G3

Analysis of data (qualitative text analysis)

## References:

- Blömeke, S., Gustafsson, J. E., & Shavelson, R. (2015). Beyond dichotomies: competence viewed as a continuum. *Zeitschrift für Psychologie*, 223 (1), 3-13.
- Gibbons, P. (2002). *Scaffolding language, scaffolding learning: Teaching second language learners in the mainstream classroom*. Portsmouth: Heinemann.
- Gogolin, I. & Duarte, J. (2016). Bildungssprache. In J. Kilian, B. Brouer & D. Lüttenberg (Eds.), *Handbuch Sprache in der Bildung* [language in education] (pp. 478-499). Berlin: De Gruyter.
- Halliday, M. (1978). *Language as a social semiotic: social interpretation of language and meaning*. London: Edward Arnold.
- Maier, H., Schweiger, F. (1999). *Mathematik und Sprache* [mathematics and language]. Wien: Öbv & hpt.
- Schütte, M., Kaiser, G. (2011). Equity and the Quality of the Language used in Mathematics Education. In B. Atweh, M. Graven, W. Secada & P. Valero (Eds.): *Mapping Equity and Quality in Mathematics Education* (pp. 237-251). New York: Springer.
- Schwarz, B. (2013). *Professionelle Kompetenz von Mathematiklehramtsstudierenden* [professional competence of future mathematics teachers]. Wiesbaden: Springer Spektrum.

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