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

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The state funded project ‘Professional teaching practice to promote subject-related learning under changing social conditions’ (ProfaLe) aims at improving teacher education at the University of Hamburg at various levels: One objective is to sensitize future mathematics teachers to language difficulties in mathematical learning processes and tasks as well as to promote professional competence in helping students to tackle possible learning barriers based on language difficulties. For this purpose, courses, which integrate aspects of language learning into mathematics education, are going to be developed and their effects will be evaluated in an ongoing PhD study using video-vignettes and interviews.

International large-scale studies like PISA and TIMSS and other studies have repeatedly shown that a connection between the first language, language proficiency and the mathematical performance of students exists. Especially skills referring to a language register described by Gogolin (2009) as academic language (so-called ‘Bildungssprache’) have proven to be vital for educational success. In mathematics classes different language registers are needed and used: everyday language, ‘Bildungssprache’ and mathematical language. Halliday defines register as “a variety according to use; a register is what you speak at the time, depending on what you are and the nature of the activity in which the language is functioning” (Halliday, 1978, p. 31). Consequently there is no translation from one register into another without shifts in meaning and function, but it is often not possible to make a clear separation between the registers. The concept of ‘Bildungssprache’ refers to the ability to employ language skills in order to access knowledge and participation in education discourse (Gogolin, 2009). Language in mathematics teaching and learning has not only a communicative, but also a cognitive function (Maier & Schweiger, 1999) and is for instance very important for developing mathematical concepts. Although teachers should promote language skills according to the German national standards, language is seldom addressed explicitly in ordinary classroom activities (Schütte & Kaiser, 2011) and future mathematics teachers at the University of Hamburg are currently not obliged to attend courses focussing on the subject-specific role of language in teaching and learning. For this reason, elements of inclusive language teaching are going to be developed, tested and implemented into two consecutive courses at the master studies in mathematics teacher education.

The first course refers completely to the role of language in teaching and learning mathematics and offers opportunities to learn about linguistically diverse students from the perspective of intercultural education, applied linguistics and language teaching. The second course accompanies the school internship and, therefore, is more general about mathematics education and pedagogical aspects such as classroom management, nevertheless continuously considering language and its learning. The future mathematics teachers will be enabled to recognise different registers and related to that potential language barriers in written mathematics texts as well as in text-production tasks. For that

aim future teachers analyse mathematical tasks and text-vignettes as well as video-vignettes displaying mathematical solving processes of students. The future teachers will be familiarised with the approach of *Scaffolding* (Gibbons, 2002), which has proven to be effective for language-based learning difficulties and plan lessons or parts of it combining language and mathematics learning. In the second course the future teachers are developing even more awareness of the role of language by reflecting their own or joint classroom observations i.a. in the accompanying course at the university.

The ongoing PhD project aims at examining the changes concerning noticing and beliefs of the future teachers. The main research question is: to what extent can relations be reconstructed concerning the awareness of the role of language in mathematics teaching before and after an intervention? Before and after every of the two courses semi-structured interviews will examine which beliefs about the relationship between language and mathematics teaching the future teacher hold and how these beliefs may change. Based on the situated approach for measuring competencies by Blömeke, Gustafsson and Shavelson (2015) and the concept of noticing (Sherin, Jacobs & Philipp, 2011) the project presented here aims at coming closer to the measurement of the performance of the future teachers by evaluating situation-specific skills with a video-vignette. Interviews (pre-and-post) based on a video-vignette will provide data which linguistic aspects of teaching and learning mathematics future teacher notice, how they would decide to react in a specific situation and how this may change due the two courses. All data will be analysed by qualitative text analysis (Kuckartz, 2014).

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. (2009). *Zweisprachigkeit und die Entwicklung bildungssprachlicher Fähigkeiten* [Bilingualism and development of academic language skills]. In I. Gogolin & U. Neumann (Eds.), *Streitfall Zweisprachigkeit* (pp. 263–280). Wiesbaden: Verlag für Sozialwissenschaften.
- Halliday, M. A. K. (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.
- Kuckartz, U. (2014). *Qualitative text analysis*. Los Angeles: SAGE.
- 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.
- Sherin, M. G., Jacobs, V. R., & Philipp, R. A. (2011). *Mathematics teacher noticing: Seeing through teachers' eyes*. New York: Routledge.