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Collaborative learning in multigrade mathematics education at primary level

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Keywords: Multigrade classes, collaborative learning, teacher training.

Background

In Saxony, predominantly in rural areas, social and political challenges are being posed by a declining number of pupils. To prevent especially younger pupils from having to travel long distances to school, organisational and curricular alterations are being considered. One suggestion is the merging of grades to establish multigraded classes. Multigrade education is also being discussed for its pedagogical advantages; for example, it can make the first phase of primary school more flexible by allowing pupils to remain within the same multigraded class for either one, two or three years. However, even in learning groups which are homogeneous in age, the differences between pupils' preconditions for learning can be up to four years (Hirt & Wälti, 2008). Yet, when making learning groups heterogeneous in age, the diversity of learning preconditions increases, and with it also the necessity for differentiation through diverse tasks with various levels of difficulty. For a subject like mathematics, which is strongly guided by a systematic course, this often means extremely individualised and separated learning (Nührenbörger, 2007). However, interaction is seen as foundational constituent of learning in early years (Miller, 1986; Schütte, 2009) and should not be neglected. More specifically, for mathematical learning to occur it is of great importance for the pupils to participate increasingly in collective reasoning within classroom interaction (Krummheuer, 2011). To enable individualised learning to take place in cooperation with others, *substantial learning environments* hold great potential both for mathematics education in general and specifically in multigrade mathematics education because they offer the opportunity for *natural differentiation*, which means that learners all work on the same task and the differentiation is not predetermined by the teacher but chosen by the pupils themselves (Scherer, 2013). The possibility for students to learn with and from others by communicating and helping each other is also seen as one of the pedagogical arguments for purposeful mixed-age grouping (Wagener, 2014).

Project

The question this research project wants to address is how collaborative learning takes place in multigrade mathematics education at primary level. Therefore, firstly student teachers at the TU Dresden are asked about their experiences with multigrade education by using a questionnaire. Then, an interview study with individual teachers who teach in multigraded classes in Saxony will be conducted in order to identify their attitudes and concepts concerning multigrade mathematics education. Based on these empirical results, concepts and learning environments for multigraded learning within mathematics education for grades 1–6 will be developed in cooperation with teachers and student teachers in order to prepare them for the future challenges they will face when teaching mathematics in multigraded classes. Later these learning environments will be applied with pupils

in practice to test the suitability of the tasks. The collaborative processes the pupils use to solve the tasks will be filmed, transcribed and then analysed from an interactionist perspective (Krummheuer, 2011) to reconstruct constituent characteristics of successful multigrade mathematics education. This process will be accompanied by the development of seminars for student teacher concerning collaborative learning in multigrade mathematics education.

Initial results

The initial results of a questionnaire with student teachers at the TU Dresden show that less than 40% have experienced multigrade education in some form (e.g. during an internship, while being a student themselves). Even though they are all able to reflect about possible advantages and disadvantages of multigrade education, many of them say that they would feel overwhelmed, unsure or not prepared to teach in a multigraded class during their traineeship. These results need to be assessed in more detail but they emphasize the necessity of training teachers more specifically for multigrade education.

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