

‘MIND THE GAP!’ – LANGUAGE BASED ITEM DIFFICULTIES IN MATHEMATICS AS A ‘CULTURAL GAP’?

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A huge number of German students with low socioeconomic status (SES) perform poorly in Large-Scale-Studies, as it is documented over the years in results of international studies. Following this, the paper discusses as part of a phd-project the question why these students fail repeatedly in corresponding studies. Therefore, approaches of sociology and sociolinguistics will be used to develop a broader perspective on both the level of mathematic items and the level of students' processes when solving mathematic items. For this purpose, quantitative (Differential Item Functioning) and qualitative analysis (Think-Aloud-Protocols of task-orientated interviews) will be presented.

Keywords: Item bias, literacy, word problems

INTRODUCTION

International Large-Scale-Studies as the IEA's *Trends in International Mathematics and Science Study* (TIMSS) for primary school as well as the OECD's *Programme for International Student Assessment* (PISA) for secondary schools document for the last decade that there is especially one group of students that perform poorly in all assessment domains: students with low socioeconomic status (e.g. Stubbe, Tarelli & Wendt 2012). Research therefore primarily concentrate on students with migration background in Germany because of the variety of challenges they have to overcome within the educational domain. But, there also exists many students without migration background who speak German as their mother tongue and perform as less in Large-Scale-Studies as students with migration background. The presented study focus on monolingual German students by taking *language* as an essential part of learning processes for granted, albeit not by locating its challenges in the acquisition of German as a second or foreign language but within German as mother tongue.

HOW DO STUDENTS WITH LOW SES SOLVE MATHEMATIC ITEMS?

Taking a sociolinguistic lens to deal with this issue means combining both the students' social strata and learning environment within their families as well as their school performance measured within Large-Scale-Assessments. As pioneer for this paper, it has been Bernstein's benefit in the 1960s to call attention to the mismatch of students' home and school (Bernstein 1972): Within the course of socialisation students adopt a repertoire of language-usages, so to say a repertoire of literacy skills that become relevant when entering school and face with school tasks (Lareau 2011). With respect to such literacy skills, a huge number of students with low SES are less well-resourced as students with higher SES (OECD 2012). Here, a 'cultural gap'

(Bourdieu & Passeron 1990) becomes visible. Literacy includes not only those skills that are measurable within Large-Scale-Studies but a variety of dimensions. In order to understand the students' processes of solving items, the concept of literacy within this paper is not only taken as a 'school-taught collection' (Cook-Gumperz 2006) but rather as "a socially constructed phenomenon" (ib., p. 4) that becomes understandable within "a complex of situated, context-embedded communicative practices" (ib., p. 3). As a consequence thereof, the socially constructed practices of literacy students use to solve mathematic items will be discussed with respect to two exemplarily selected challenges: (i.) the morphology and syntax used in items (Zevenbergen 2000), and (ii.) the social situatedness of solving items.

METHODS AND DATA

Within TIMSS 2007, Differential Item Functioning (Holland & Wainer 1993) was used to identify those mathematic items that adversely affect fourth graders with low SES compared to those with high SES. Additionally Think-Aloud-Protocols (n=25) have been taken to get a deeper understanding about students' strategies and making meaning in solving items.

RESULTS

Results show that there are items that are more difficult to handle for students with low SES than for students with higher SES, and that these as biased detected items contain challenges especially with respect to its language. Therefore it is assumed, that a language-based social disadvantage as reasoned from a sociolinguistic perspective exists, at least for the discussed items. These results are corroborated by the analysis of the students' processes when solving mathematic items. Within microanalysis of transcripts composed of students' arguments and narratives it becomes visible wherein individual capabilities and boundaries in solving mathematic items are located.

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