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► To cite this version:

Stefanie Winkler, Matthias Brandl. Process-based analysis of mathematically gifted pupils in a regular class at primary school. CERME 9 - Ninth Congress of the European Society for Research in Mathematics Education, Charles University in Prague, Faculty of Education; ERME, Feb 2015, Prague, Czech Republic. pp.1101-1102. hal-01287321

HAL Id: hal-01287321

<https://hal.science/hal-01287321>

Submitted on 12 Mar 2016

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Process-based analysis of mathematically gifted pupils in a regular class at primary school

Stefanie Winkler and Matthias Brandl

University of Passau, Faculty of Computer Science and Mathematics, Passau, Germany,
winkler-steffie@arcor.de, Matthias.Brandl@Uni-Passau.de

With heterogeneity at schools growing, individualisation of education has become more important than ever. For teachers it is vital to recognise their pupils' diverging abilities effectively in order to meet the pupils' respective learning requirements. The following project, which is based on a regular education setting at primary school (3rd/4th graders, German Primary School), aims at showing ways to identify and characterise mathematically gifted pupils during regular lessons.

MATHEMATICAL GIFTEDNESS IN PRIMARY SCHOOL

With respect to the development of mathematical skills and interests at primary school, two relevant projects have been influencing effective teaching at German Primary Schools: F.W. Käpnick, who picked out children according to their own motivation or teachers' reference and let them take part in extra mathematics lessons where their methods of working mathematically could be monitored (Käpnick, 1998, pp. 36–38). M. Nolte initiated extra meetings for inter-

Keywords: Mathematical giftedness, mathematical thinking, inquiry-based learning, process-based analysis.

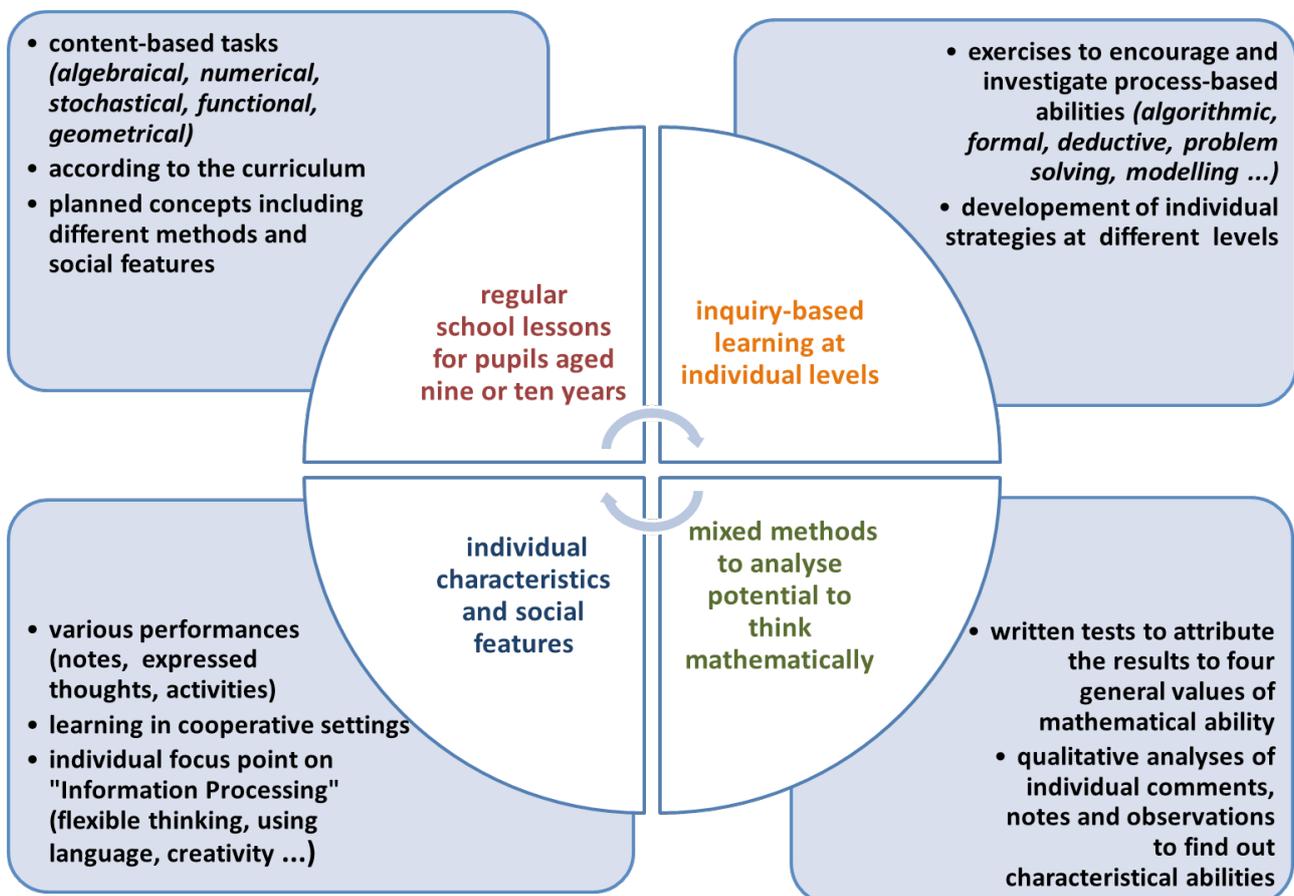


Figure 1: Empirical framework for a process-based analysis of mathematical gifted pupils in primary school

ested pupils, and implemented tests and challenging exercises (Nolte, 2004, pp. 17–20). Both stated that it is quite difficult to define or even categorise an exact level of mathematical giftedness, if pupils are chosen only according to teachers' references, parents' suggestion or their performance in standardised tests (Käpnick et al., 2005, pp. 18–28). We assume that "mathematical giftedness is the individual potential to think mathematically. (...) High mathematical giftedness is characterised by an above-average potential in several aspects of mathematically thinking." (Ulm, 2011, p. 7) Content-, process- and information-based thinking as well as environmental and individual features influence the pupils' ideas, results and performances (Ulm, 2011, pp. 6–9).

Empirical project and analysis

This project focusses on the research question whether there are significant differences between the mentioned ways of identifying mathematical giftedness, and what a simple identification tool for teachers' observation in everyday classroom situations must look like in order to allow for a successful identification of gifted pupils. With regard to research methodology, the development of different tasks which correlate with varying aspects of mathematical thinking builds the starting point when it comes to encouraging pupils during lesson to work on a topic independently and cooperatively (cf. upper half of Figure 1). In addition, various didactical settings and methods offer a detailed, qualitative view on the pupils' individual mathematical abilities (cf. Figure 1 below). Afterwards, observations are interpreted by a qualitative content analysis. The latter considers different aspects of mathematically thinking corresponding to four levels of mathematical ability. In a final step, the results are compared to the results of standardized tests.

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