Preface

Spatial-geometrical competencies are required in mathematics continuously, starting from preschool education, then during primary and secondary education until mathematics at university level. Besides arithmetic (which is based on the concept of time), geometry (based on the concept of space) is one of the two initial ways of operating mathematically. The crucial role of geometrical thinking in general and the solving of spatial-geometrical tasks specificially lead to the long research tradition in spatial ability in both mathematics education and psychology.

In traditional psychometric-based intelligence research, spatial-geometrical competencies form a fundamental factor of intelligence in all models. Ordinarily, this factor is considered as largely independent from verbal competencies; especially in popular science discussions, whereby assumptions about different intelligence profiles (e.g., with local strengths in "figural intelligence" or in "verbal intelligence") are sometimes based on such hypotheses.

The interdisciplinary research about the relationship between language and content learning has been researched intensively in Germany in recent years; in mathematics education in particular by Susanne Prediger's research group in TU Dortmund. This research strand emphasises the dependence of other cognitive competencies from the verbal competencies, i.e. the interdependency between verbal and other cognitive competencies. Previous findings in language and content learning research can be categorised either as general results about the integrated verbal and content learning or as results which are specific for particular content in mathematics education. Relevant works are present for mathematical content beyond geometry, e.g. fractions, percentages, descriptive statistics, functions, and elementary algebra. In contrast, there is still a substantial need for research regarding the integrated language and content learning in geometry, in particular in the area of spatial geometry.

A fundamental question arising in the context of mathematics education and mathematics classroom is: Which role do verbal competencies or language use play during the solving of spatial-geometrical tasks? The dissertation of Angel Mizzi addresses this issue - according to the interdisciplinary character of the question - by successfully synthesising theoretical principles from mathematics

education, from linguistics and language teaching, and from psychology. The design of the reconstruction method in his work generates a data collection situation which enables a methodologically-controlled empirical study of his underlying research questions. Hereby, a student is required to rebuild a pre-designed object made up of building cubes based on oral instructions from another student. The foci of this study include the strategies developed by students and potential obstacles arising during the solving process, which can be observed in the communication setting. These goals were achieved by an analysis of spatial language used by students in the solving processes.

In view of this theoretical and methodological background, the author succeeds in developing important results which show that language plays an important role during the solving of spatial-geometrical tasks. The analysis of spatial language used by students leads to a differentiation of previous models about strategies used for solving spatial-geometrical tasks. By his own way of use and enrichment of the construct of spatial language, Angel Mizzi succeeds to create an important foundation work for a deeper investigation of the relationship between language and spatial ability. Due to the importance of the underlying issue focussed on in this work further future research projects are expected to emerge following this dissertation.

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An Analysis of Spatial Language for Reconstructing the Solving of Spatial Tasks

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