Conceptions of area and volume of pupils at the elementary school

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ABSTRACT: The aim of my thesis is to investigate how the conceptions of area and volume are built, what the major pitfalls and problems are, what skills and strategies are helpful for solving problems and what are the frequent unsuccessful strategies and pupils´ misconceptions. I used the concept of the hypothetical learning trajectory as a tool to describe this process. Based on existing research review, I compiled two hypothetical learning trajectories – one for area and one for volume. The crucial building blocks that were identified based on these trajectories are: space abilities, structuration of space into arrays of units and multiplicative thinking. A test was designed to measure these factors and the correlation of these factors with success in volume and area problems ranged from week (multiplicative thinking) to very strong (spatial abilities). These findings confirm that these factors constitute an important part of the hypothetical learning trajectory for both concepts. Several structuration tasks were selected to investigate pupils´ structuration skills and mistakes in more detail. Three main categories of problems were identified in the pupils´ solutions: incorrect space structuration, disconnection between calculation and a geometrical situation (compartmentalization and / or pseudo-analytical reasoning were found as possible explanations) and using mathematical terms and conventions incorrectly.

KEYWORDS: Area, volume, hypothetical learning trajectory, spatial abilities, structuration of space, multiplicative thinking, representations, errors.