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What large scale video studies tell us about the impact of surface and deep level features of instruction on students' learning outcomes

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Despite an impressive body of literature on effective mathematics teaching, there are only few studies that simultaneously look at a whole array of both surface and deep level practices and dimensions of instructional quality in authentic mathematics classrooms. And there are even fewer studies focusing on content-specific (mathematical) factors of instructional quality.

In this lecture, analyses of two video studies on the introduction of the Pythagorean Theorem shall be presented. Both studies had a longitudinal design (1 year) and were based on a sample of 20 German classes and 20 Swiss classes from two school types: the academic track ("Gymnasium") and the intermediate track ("Sekundarschule"/"Realschule"). In each class, three consecutive lessons were videotaped. The analyses shall draw on data from 1,015 students in grade 8 and 9. In addition to the videos, the database included a pretest, a posttest, student and teacher questionnaires, as well as interviews.

Along the theoretical lines of the studies, findings regarding the impact of the following – surface level and deep level – features and dimensions of instructional quality on learning outcomes (achievement, quality of understanding) shall be expounded:

- the *choreography of teaching* (➔ types of teaching methods and social organization of learning);
- cognitive activation of students, supportive learning environment, and efficient classroom management (➔ *basic dimensions of instructional quality*);
- explicit attention to and the overall coherence and transparency of the essential conceptual elements of the learning content (➔ *focus on domain-specific core content elements and connections* relevant to mathematical understanding);
- the targeted level of cognitively stimulating classroom discourse as a means to promote students' constructive cognitive activities and higher-order thinking (➔ *dialogic quality of the discourse).*

A conclusion to be discussed goes as follows: If teaching for mathematical understanding is the goal set for all students, what matters is not so much the surface features of instruction or the methods, but rather the deep level aspects of – content-related (!) – teaching quality.

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