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Cognitive activation as an interaction feature: A qualitative-reconstructive video study of a basic dimension of teaching quality

Abstract

Cognitive activation is treated as one of the Three Basic Dimensions of teaching quality in German-speaking countries (Praetorius et al. 2018). This dimension is based on constructivist learning theories and is considered to be the most related dimension in terms of student learning (Lipowsky et al. 2019). So far, it is still unclear whether cognitive activation can be regarded as a generic dimension of instructional quality or whether it needs to be operationalized specifically for the individual subjects. Furthermore, the results of various Video Studies show that, on the one hand, the agreement between external observers is mostly weak and, on the other hand, the values for cognitive activation are rather low compared to other dimensions of instructional quality (Bell et al. 2020). Moreover, cognitive activation is predominantly operationalized as an instructional offering (through tasks or stimuli provided by the teacher). The actual use of these offers by the students, however, is less considered.

In the context of the TALIS Video Study in Germany, a total of 50 mathematic teachers, grades 8 to 10 from different school forms, were recorded on video on the subject of quadratic equations. For a qualitative-reconstructive analysis using the documentary method (Bohnsack 2011, Asbrand & Martens 2018), individual sequences were analyzed with regard to their cognitive activation.

The lecture will show first considerations of the identified types, which will be demonstrated by two contrasting video examples. The first type is characterized by an instructivist understanding of the teacher and a rather reproductive attitude of the students towards the construction of knowledge. In contrast, a second type shows an independent acquisition of knowledge by the students, which is supported by a subject-focused task and a constructively supportive behavior of the teacher. Based on these analyses, an expanded, empirically guided understanding of cognitive activation can be developed.

Extended summary

Research on the quality of teaching can be traced back to the 1960s. It was in particular Caroll (1963) with his model of school learning that generated this type of research. Further conceptual differentiations and modifications of this model were later made by Slavin (1994) and Creemers (1994). The TIMSS Video Study 1995 (Stigler et al. 1999) has given a major boost to research on the quality of teaching in Germany. The analysis of videos from Japan, Germany and the USA identified different teaching patterns. Klieme et al. (2001) observed the pattern of the open-end approach, which was considered to be particularly cognitively activating, especially in Japanese videos. Based on these results of the TIMSS Video study, the framework of Three Basic Dimensions of good teaching were developed, which have been widely analyzed to date (for an overview please see: Praetorius et al. 2018). Parallel to the discussion of Three Basic Dimensions in German-speaking countries, similar findings of a three-dimensional teaching structure were also found in the Anglo-American countries (Pianta & Hamre 2009).

Within the framework of Three Basic Dimensions, in addition to classroom management and social support, especially cognitive activation is seen as an important indicator for learning growth of students (e.g., Kunter & Voss 2011, Lipowsky et al. 2009). The concept of cognitive activation is said to have a constructivist understanding of teaching and learning. Teaching is supposed to be cognitively activating especially when it is geared towards understanding and conclusions, when demanding contents and tasks are set and when it ties in with the student's previous knowledge and experience (Klieme 2018). Many internationally developed concepts are compatible with the moderate constructivist understanding of cognitive activation. One of these concepts e.g., is higher order thinking. Newmann (1988) distinguishes between lower and higher order thinking. Lower order thinking is mainly described as problem-solving situations that are limited to the routine application and technical use of solution strategies. Higher order thinking otherwise requires strategies that sting a person into interpreting analyzing or manipulating the given information. Solving a task also depends on the respective previous knowledge of a person, which makes it more difficult to be assessed by others. Another concept that is linked to cognitive activation is scaffolding. Following Vygotsky's (1986) social constructivist theories, the teacher's behavior is understood as a kind of scaffolding, in which the teacher advances the learner in the zone of next development through specific instructions. The teacher only gives as few instructions as are necessary to solve the problem (Wood, Brunner & Ross 1976).

However, the assessment and evaluation of cognitive activation, especially in observational studies, poses certain problems. The biggest problem is the non-observability of the actual cognitive activation of a student. For this reason, observational studies can only infer the potential of cognitive activation

(Klieme 2018), e.g., the extent to which the teacher designs the learning environment to enable cognitive activation for the students. At the measurement level, it is repeatedly shown that the agreement values between raters are rather low in relation to the dimensions of classroom management and emotional support (Lipowsky et al. 2009; Decristan et al. 2016). Another problem seems to be the strongly teacher-centered perspective in the assessment of cognitive activation. When looking more closely at the teachers, the student's perspective is often hardly or not at all perceived. In addition, the problem of the black-box remains: the view into the heads of the students remains closed, so that a direct cognitive activation can't be observed anyway.

A new approach for the observation of cognitive activation will be tested in this study. The analyses presented here follow an understanding in which teaching is understood as an interaction of 'offers' and 'use'. These 'Offer-Use'-models (Helmke 2017, Vieluf 2020) assume that the offers often induced by the teacher (e.g., in the form of tasks or questions) must be used by the students in order to have an effect on them (e.g., in the form of learning growth). Through this understanding of offer and use, the offer structured by the teacher represents the condition of the possibility of use by the students but does not determine it. According to this conception, the question of whether and how the offer is used also depends on the characteristics of the students as well as contextual factors.

Using a research approach to analyze classroom interactions (Asbrand & Martens 2018), the aim of this study is to take a closer look at the processes of cognitive activation in the classroom in order to generate an empirical basis for the description of cognitive activation. The analyses will be based on videos from the TALIS Video Study in Germany. From the videos of a total of 50 teachers that were recorded twice in the teaching unit of the quadratic equations in mathematics lessons, individual subsequences are selected and analyzed in a qualitative-reconstructive way. The sequences selected in this way are evaluated using the documentary method by Bohnsack (2011), which has been extended by Asbrand and Martens (2018) to a method specially developed for the analysis of teaching videos. The documentary method has proven to be particularly suitable for recording learning and competence acquisition processes (Martens & Asbrand 2009).

The analyses show that in classroom interaction there are different patterns of action in terms of cognitive activation. In this talk, two of these identified types will be presented on the basis of two contrasting video sequences. The first type is characterized by an instructivist understanding of the teacher and a knowledge-reproducing attitude of the students. Specifically, in the sequence a problem is induced by the teacher that is not addressed as such by the students themselves. The teacher ends the sequence by having a student memorize and recite the correct application sentence. In the second case, the teacher's claim to transform a real-world problem into a mathematical equation becomes clear. The students who show a strong orientation towards solving the problem fulfill this demand in their interaction with the teacher.

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