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Effects of collaboration scripts and heuristic worked examples on the acquisition of mathematical argumentation skills of teacher students with different levels of prior achievement.

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Summary: A challenging demand for mathematics teacher students is to produce acceptable scientific mathematical argumentations. We investigated to what extent mathematics teacher students with different levels of prior achievement who collaborated in dyads can be supported in their development of mathematical argumentation skills by two different instructional approaches that were systematically varied in a 2×2-factorial design: collaboration scripts (with vs. without) and heuristic worked examples vs. problem solving. An experimental study was run in the context of a two-weeks preparatory course for beginning mathematics teacher students ($N = 101$). Mathematical argumentation skills were conceptualized as consisting of an individual-mathematical and a social-discursive component. Results indicated positive effects of both scaffolds on the social-discursive component. Moreover, the effects of both scaffolds on both components were dependent on learners' prior achievement (high-school GPA). Heuristic worked examples and collaboration scripts were particularly effective in the facilitation of mathematical argumentation skills for teacher students with higher general learning prerequisites. Possible process-based explanations for this pattern of results as well as ways to more specifically address the needs of teacher students with lower prior achievement are discussed.

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