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Developing argumentation skills in mathematics through computer-supported collaborative learning: the role of transactivity.

Summary: Collaboration scripts and heuristic worked examples are effective means to scaffold university freshmen's mathematical argumentation skills. Yet, which collaborative learning processes are responsible for these effects has remained unclear. Learners presumably will gain the most out of collaboration if the collaborators refer to each other's contributions in a dialectic way (dialectic transactivity). Learners also may refer to each other's contributions in a dialogic way (dialogic transactivity). Alternatively, learners may not refer to each other's contributions at all, but still construct knowledge (constructive activities). This article investigates the extent to which constructive activities, dialogic transactivity, and dialectic transactivity generated by either the learner or the learning partner can explain the positive effects of collaboration scripts and heuristic worked examples on the learners' disposition to use argumentation skills. We conducted a 2×2 experiment with the factors collaboration script and heuristic worked examples with $N = 101$ math teacher students. Results showed that the learners' engagement in self-generated dialectic transactivity (i.e., responding to the learning partner's contribution in an argumentative way by critiquing and/or integrating their learning partner's contributions) mediated the effects of both scaffolds on their disposition to use argumentation skills, whereas partner-generated dialectic transactivity or any other measured collaborative learning activity did not. To support the disposition to use argumentation skills in mathematics, learning environments should thus be designed in a way to help learners display dialectic transactivity. Future research should investigate how learners might better benefit from the dialectic transactivity generated by their learning partners.