

Supporting Discussions through Argument Diagrams and Collaboration Scripts

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Abstract (100- 250 words)

A considerable focus in online learning has been placed on promoting high-quality forms of argumentation with different instructional approaches. In the knowledge representation approach, students create external knowledge representations, such as argument diagrams, to classify and organize relevant domain knowledge in a systematic way. In the scripting approach, students communicate through a structured communication interface that enforces or encourages a desired mode of communication. Each approach typically provides support on a different level: Knowledge representations provide a structuring on the epistemic level (i.e., relevant knowledge and relations) while scripts provide a structuring on the social level (i.e., fruitful discussion moves and interactions). Since the generation of high-quality discussion moves requires both, appropriate use of domain knowledge and appropriate forms of social interaction, we hypothesize that the combination of argument diagramming and a scripted interface can have synergistic effects in promoting high-quality argumentation. In a control group design (N = 44) we compare students in an argument-diagramming environment with versus without a script. Results show that scripting could additionally enhance argumentative quality of the discussions, but did not improve learning outcomes.

Summary (600 -1000 words; aims, methodology, findings, theoretical and educational significance)

Promoting high-quality forms of online argumentation has attracted lots of research interest in the past years (Noroozi et al., 2012; Scheuer et al., 2010). Two instructional approaches have been investigated particularly thoroughly in computer-supported collaborative learning, but so far have hardly been combined, namely argument diagrams, i.e., external knowledge representations students create before or while discussing a topic, and scripts, i.e., activity programs represented by special-purpose communication interfaces that structure messages and interactions according to an underlying model of ideal or desired discourse. A diagram may classify the different components of a scientific argument according to their epistemic roles (e.g., hypotheses, data) and argumentative relations (e.g., hypotheses "contradicting" one another; a piece of data "supports" a hypothesis). The pre-structured domain knowledge in such a diagram can serve as a valuable resource during student discussions, stimulate and guide (joint) reflection on important concepts of scientific argumentation (Suthers, 2003). Scripts provide a more direct (and possibly more effective) structuring of social interactions, e.g., through predefined sentence openers students choose from when composing new messages (Soller, 2001). However, students may perceive the script as an unnecessary burden, rather than an aid, as evidenced by sentence opener misuse (Soller, 2001) and non-use (Lazonder et al., 2003).

We hypothesize that the combination of argument diagrams and a script can have synergistic effects on the quality of student discussions. Our rationale is that each approach operates on one specific level: Argument diagrams support students in understanding relevant domain knowledge on an epistemic level, while scripts support students in engaging in desired modes of student-student interactions, that is, support on the social level. Since the generation of high-quality discussion moves requires both, appropriate use of domain knowledge and appropriate forms of social interaction, students may benefit from scaffolding on both levels.

We investigated one aspect of the hypothesis presented above: How does a baseline setting, in which students create and discuss argument diagrams, compare to a setting, in which students are guided by a script to create and critically discuss argument diagrams, with respect to learning processes and outcomes?

Methods. In this study, 44 students participated, who were enrolled in the Humanities and Social Sciences at Saarland University, Germany, yielding 12 experimental dyads (with script component) and 10 control dyads (without script component). The study procedure comprised a pre-questionnaire, training with the LASAD diagramming environment, the actual learning task, and a post-questionnaire. In the baseline setting, student dyads analyzed and discussed two conflicting texts on climate ethics. Each student had exclusive access to one of the two texts. The learning task comprised four phases (overall, about 85 minutes): analyzing (phase 1; individual), discussing (phase 2), and interrelating (phase 3) the two texts with the goal to jointly generate a well-reasoned conclusion at the end (phase 4). As technological platform, the LASAD argumentation system

was used (Loll et al., 2012), which provides a shared workspace to support argument-diagramming activities, and a chat tool to support communication. The script component in the enhanced version was implemented through a sentence opener interface designed to precisely support the roles of a proponent and a constructive critic. The sentence opener interface replaced the standard chat, and was briefly introduced to the students between phase 2 and 3 (three minutes of instructions). Students assumed the role of a proponent for "their" text and the role of a constructive critic for their partner's text.

The results reported here are based on an analysis of (1) sentence opener usage, (2) chat protocols (in terms of elaboration depth), (3) self-assessment of learning (post-questionnaire), and (4) factual knowledge of the two texts (post-questionnaire).

Results. Overall, we found evidence in favor of our hypothesis on different dimensions: a trend with large effect size regarding the number of elaborative moves (i.e., arguments, counterarguments and explanations), a trend regarding students' assessment whether they learned about argumentation, and a significant effect regarding students' assessment about whether they learned to argue better. A closer look at the experimental condition showed that students indeed utilized the sentence openers to their advantage: two thirds of dyads made frequent or occasional use of sentence openers. No differences were found in terms of detailed knowledge of the given texts. Regarding the question whether diagrams and scripts can have synergistic effects, we observed in some cases that students reused text fragments from their argument analysis and combined them with appropriate sentence openers to compose chat messages. Thus, combining argument diagrams and sentence openers might indeed have led to benefits that could not have been achieved with either method alone.

Conclusion. Our results suggest that the combination of epistemic scaffolds (e.g., argument diagrams) and social scaffolds (e.g., a scripts based on sentence openers) can help students engaging in high-quality discussions. A promising direction for future research is to more closely investigate possible interactions emerging from the combination of scaffolds that operate on different levels.

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