Scaffolding Argumentation Competence: The Shift from First to Second Order Skill Acquisition

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Abstract: This conceptual article argues that the focus of research on argument-scaffolds should shift from first-order towards second-order scaffolding. If learners acquire argumentation skills and learn to self-direct argumentation activities, they also engage in epistemic discussions with partners that help them acquire knowledge, correct false viewpoints and refine misunderstanding. This article presents a 3-step guideline for second-order argument-scaffolding, namely (1) diagnosis of internal argumentative script, (2) adaptive external support, and (3) adaptive fading of external support.

Introduction

Argumentation is an essential aspect of scientific thinking and entails the ability to reason by applying rules of formal logic to deal with complex problems in academic settings. Research on fostering educational argumentation as a pedagogical approach for collaborative learning has been influenced by developments in technology-enhanced environments focusing on the role of computer-support systems for scaffolding various aspects of argumentation processes (see Noroozi et al., 2011, 2012, 2013a, 2013b, 2013c). Various instructional scaffolds have been embedded in online environments through graphical representational tools in the form of schemes, tables, or visualizations to support dialogical argumentation processes, or in a more textual implementation in the form of cues, prompts, or scripts to orchestrate various roles and activities of learners for procedural scaffolding of specific interaction patterns (see Kirschner et al., 2003; Scheuer et al., 2010; Noroozi et al., 2012 for an overview). The scaffolds developed, implemented and researched up until now have been meant primarily to stimulate argumentative discourse activities for learning within a particular domain (i.e., to achieve effects with argument scaffolding) and not to help learners acquire argumentation skills and self-regulate them for application in new situations (i.e., to achieve effects of argument scaffolding). The focus of argument-scaffolds should not only be on providing support for the performance of the complex skill (first-order scaffolding) but also on decreasing that support over time for promoting acquisition of self-directed learning skills (second-order scaffolding) (see Merriënboer & Kirschner, 2013).

The process of acquiring argumentation skills can differ depending on the learners' own individual, already developed, and often idiosyncratic internal script that indicates how a person will act in and understand a particular situation (see Kollar et al., 2007). An argumentation script can be seen as a specific instantiation of a CSCL script. "A [CSCL] script describes the way students have to collaborate: task distribution or roles, turn taking rules, work phases, deliverables, etc. This contract may be conveyed through initial instructions or encompassed in the learning environment" (Dillenbourg & Jermann, 2007, p. 275). In turn, an internal argumentation script is an instantiation of what Fischer et al. (2013) call an internal collaboration script: "a configuration of knowledge components [that a person has] about a collaborative practice and its parts at different levels of complexity…that guide the person's understanding of and actions in the collaboration" (p. 57) while an external script is "a configuration of representations (e. g. textual or graphical) of a collaborative practice and its parts at (potentially) different levels of complexity…presented to a group of learners by an external source (e.g., a teacher or a website interface) as a means to guide their collaborative activities" (p. 57).

Scientific evidence suggests that the optimal learning scenario - in this case acquiring and applying argumentation skills - depends on the interplay between external and internal scripts (see Kollar et al., 2007), meaning that overly detailed instruction impedes learning when the provision of the external support inhibits the learner' self-regulated application of the internal script (Fischer et al., 2013). In such a situation, the external script may interfere with the internal script. Specifically, this occurs when the external script targets already developed internal script components that do not need further scaffolding or targets them in a way that conflicts with how the person already effectively works rather than targeting those internal script components that need to be scaffolded. As a result, processing these unneeded or interferential/conflicting scaffolds not only may cause unnecessary cognitive load but may also prevent developing higher level internal script components by taking away the self-regulation from the learners (see Fischer et al., 2013).

External scripts will only be effective when they trigger the accompanying specific collection of internal script components, if these internal script components exist in the learner or if the external scripts do not conflict with or are not redundant to the internal script components. In this situation, learners are first supported by the external scripts to further develop their corresponding internal script components by repeated application

and are then given the opportunity to practice and apply their newly developed internal script components for regulating their activities, which in turn results in the internalization of the external scripts and enrichment of the internal script (Fischer et al., 2013). This situation is particularly effective for learners when their idiosyncratic internal script is or becomes similar to the external script. Internalization of the external script and development of the internal script occurs if and when the learner is aware of the corresponding activities and the underlying reasoning behind the activities; otherwise it becomes a procedure aiding the student at that moment (i.e., effects with) that will not be transferred to other relevant situations (i.e., effects of). Fading external scripts or gradually transferring the learning responsibility from the environment to the learner has been argued to be an effective approaches to realizing an optimal interplay between external and internal scripts (see Kollar et al., 2007). However, additional support during the fading is needed if learners are to dynamically reconfigure their internal script components as a response to changing situations and their individual goals to continue acting in accordance with the strategy suggested by the external script (Fischer et al., 2013; Wecker & Fischer, 2011).

Few instructional approaches have been proposed to complement fading for internalizing and securing continuous application of the strategy in external scripts. This conceptual paper uses a narrative analysis approach to synthesize and integrate literature on this topic with the goal of developing a guideline for second-order scaffolding of collaborative argumentation-based learning and for addressing practical implications and avenues for future research. This paper proposes a 3 step guideline for scaffolding collaborative argumentation-based learning in such a way as to secure acquisition and continuous application of the argumentation strategies, namely 1) diagnosis of the internal argumentative script, 2) adaptive external support, and 3) adaptive fading of this external support. Specifically, this paper suggests mechanisms in which automated analysis techniques can be used to recognize the internal scripts of both individuals and groups of learners and their learning processes for providing dynamic support and adaptive fading. It also suggests to combine artificial intelligence and computer-linguistic tools to provide learners with dynamic support and adaptive fading depending on their argumentative discourse activities. Finally, this paper suggests to complement adaptive fading support with self-assessment, peer-assessment, and automatic response tools to ensure that learners actually understand and learn the targeted argumentative activities in the external support.

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