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LASAD: Flexible representations for computer-based collaborative argumentation

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Abstract

Teaching argumentation is challenging, and the factors of how to effectively support the acquisition of argumentation skills through technology are not fully explored yet. One of the key reasons for that is the lack of comparability between studies. In this article, we describe LASAD, a collaborative argumentation framework that can be flexibly parameterized. We illustrate the flexibility of the framework with respect to visualization, structural definitions and kind of cooperation. Using this framework, this paper presents an evaluation of the impact of using an argumentation system with different argument representations and with collaborative vs. individual use on the outcomes of scientific argumentation. We investigate which combinations of these factors produces the best results concerning argument production and learning outcomes. The results of this controlled lab study with 36 participants showed that the use of simple representational formats is superior compared to highly structured ones. Even though the latter encouraged the provision of additional non-given material, the former is less error-prone. A hypothesized structural guidance provided by more complex formats could not be confirmed. With respect to collaboration, the results highlight that arguing in groups lead to more cluttered argumentation maps, including a higher amount of duplicate elements. An expected peer-reviewing between group members did not occur. Yet, groups also tended to include more points-of-view in their arguments, leading to more elaborated argument maps.

Keywords: Argumentation; CSCL; Visualization

1. Introduction

The ability to argue is essential in many aspects of life. Nevertheless, many people have problems to successfully engage in argumentation activities (Kuhn, 1991). This is not surprising since argumentation involves multiple skills including (according to Kuhn (1991)) (a) the skill to generate causal theories in order to support claims, (b) the skills to provide evidence to support the generated theories, (c) the skill to generate alternative theories, (d) the skill to imagine and discuss counterarguments to the existing theories as well as (e) the skill to rebut alternative theories. Together these skills are used to "[…] [produce] opinions accompanied by reasons in favor or against, in combination with questioning, clarification, explanation and acknowledgment" (Munneke et al., 2003, p. 115) in order to "[…] persuade or convince others that one's reasoning is more valid or appropriate" (Carr, 2003, p. 76). Thus, "an argument is regarded […] as a dialog between two (or more) people who hold opposing views. Each offers justification for his or her own view, and […] each attempts to rebut the other's view by means of counterargument" (Kuhn, 1993, p. 322).

The importance of argumentation skills has been widely recognized. Nevertheless, this importance is not mirrored in educational contexts. Here, two perspectives can be distinguished. On the one hand, the *learning to argue* perspective (von Aufschnaiter et al., 2008; Jonassen and Kim, 2010) aims at promoting the skills required to participate in a reasonable way in argumentative processes. On the other hand, the *arguing to learn* perspective (Andriessen et al., 2003; Andriessen, 2006; von Aufschnaiter et al., 2008; Jonassen and Kim, 2010; Osborne, 2010) focuses on the command of argumentation skills as an essential prerequisite in order to

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obtain domain knowledge. However, both of these educational perspectives are rarely found in modern education (Osborne, 2010) and their teaching is problematic, caused (among other factors) by limited teacher's time and availability: face-to-face tutoring is still the favored argumentation teaching method, but does not scale up well for larger groups.

One approach to deal with these issues is the use of argumentation systems (cf. Scheuer et al., 2010, for an overview). These tools engage (groups of) students in argumentation by representing the argument in a graphical fashion (e.g., using a graph, table/matrix, thread/tree) and allowing students to interact with this representation. By means of a making explicit and sharing the representation of an argument (an argument map), which is typically only an abstract entity in people's minds otherwise, these systems enable discussions and are therefore helpful for the "arguing to learn" perspective stated above. An example of such a graphical representation of an argument is shown in Fig. 1.

The number of available tools to support the creation of argument representations is large. A recent overview of about 50 approaches is presented in (Scheuer et al., 2010). Even though these tools share a common goal, that is, to support argumentation and argumentation learning, they differ in a lot of aspects. To illustrate these differences, we will briefly describe three argumentation systems in the following: Athena (Rolf and Magnusson, 2002), Belvedere (Suthers et al., 1995; Suthers, 2003), and Digalo (Schwarz and Glassner, 2007; McLaren et al., 2010).

Belvedere (Suthers et al., 1995; Suthers, 2003) is a collaborative educationally targeted argumentation tool for supporting scientific argumentation. Early versions of Belvedere (Suthers et al., 1995) were designed to engage secondary school children in complex scientific argumentation. By means of advisory guidance by an embedded intelligent tutoring system, the students are supported in their argumentation and encouraged to self-reflect. The Belvedere system went through multiple revisions and the focus of the system shifted from advisory guidance to representational guidance (Suthers, 2003), that is, guiding students' discourse by means of different argumentation interfaces.

Digalo (Schwarz and Glassner, 2007) follows a different approach than Belvedere. Instead of focusing on a domain-specific argumentation model, the underlying argument model is flexible. That is, the elements available to model the argument can be defined before the actual argumentation takes place. This way, Digalo is applicable to a larger set of argumentative problems than pre-defined systems such as Belvedere. Digalo was designed to be used in classroom in groups of three to seven students. In order to assist the teacher, it can be connected to ARGUNAUT (McLaren et al., 2010), a tool that was developed to provide a moderator with additional awareness to supervise multiple ongoing discussions at once.

Whereas Digalo and (some version of) Belvedere provide support for collaboration, Athena does not. Instead, it is used to argue on one's own (or together in front of one computer) and compare the results afterwards. Even

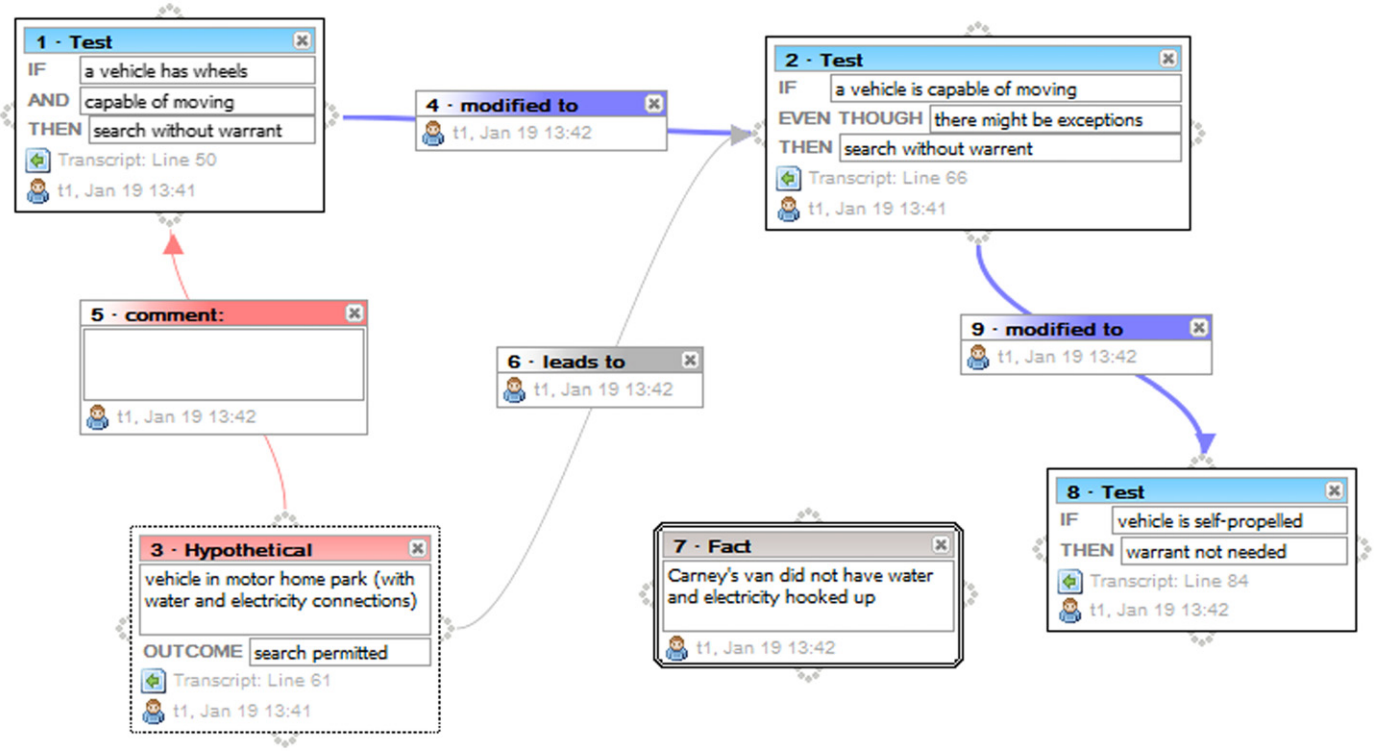

Fig. 1. Graph-based visualization of an argument structure in LASAD showing a part of a legal argument based on a given transcript.