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Review article

Group-work discussions and content knowledge gains: Argumentative inner speech as the missing link?

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ABSTRACT

The relationship between dialogue and disciplinary content knowledge learning is neither direct nor simple, but complex and mediated. Although there has been much interest in this relationship, and several empirical studies have been conducted, the mechanism through which dialogue promotes learning remains unclear. There is compelling evidence to show that group-work argumentation prompts student concept gains, especially when tests are taken weeks after group collaboration; in other words, there are delayed effects. There is no conclusive empirical evidence about the mechanism through which discussions lead to conceptual growth. Moreover, gains are not related to group outcomes or resolutions, showing that the internalization of negotiated meanings is unlikely to be responsible for gains. This paper aims to develop a sociocultural hypothesis of the effects of group-work argumentation on conceptual gains, shedding light on the role that inner argumentative speech may play in this developmental relationship.

1. Introduction

There is compelling evidence to show that collaborative group dialogue prompts student disciplinary content knowledge at different ages (Asterhan & Schwarz, 2007, 2009; Kruger, 1993; Roy & Howe, 1990; Schwarz & Linchevski, 2007; Webb, Troper, & Fall, 1995). The discussion of different perspectives (Howe, 2009; Tolmie, Howe, Mackenzie, & Greer, 1993), and/or group argumentation (Asterhan & Schwarz, 2007; Che & She, 2012; Kuhn, 2015; Schwarz & Linchevski, 2007; Zohar & Nemet, 2002), are considered to be a key factor in student progress. The important question is why the discussion of different perspectives and/or group argumentation have such an effect. There is no conclusive empirical evidence regarding the mechanism through which discussions lead to knowledge growth, which appears to be a difficult psychological research problem (Howe, 2013). This is particularly important considering there is evidence to show that although growth is predicted by the use of argumentative dialogue, it is not always related to group outcomes (Howe, 2009). Moreover, the mentioned effect is supposed to be delayed, that is, to be robust over time (see Asterhan & Schwarz, 2007; Howe, McWilliam, & Cross, 2005; Rivard & Straw, 2000; Tolmie et al., 1993).

Vygotsky (1987) believed that the use of language with others transforms the way people think because, through language, people not only communicate but also collaborate psychologically. In doing so people function psychologically in new and specific ways that are internalized when they address those language uses at themselves, thus developing inner speech — speech oriented to oneself. It is the internalization of the social uses of language that transforms psychological processes, which, from now on, occur through inner speech. If peer argumentation promotes the development of both argumentative language (see Kuhn & Crowell, 2011; Kuhn & Udell, 2003) and disciplinary content knowledge (Asterhan & Schwarz, 2007), then it is possible to think that the internalization of argumentative language plays a role.

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Through this paper, the intention is to elaborate further a sociocultural hypothesis of the mechanisms through which collaborative argumentation fosters disciplinary content knowledge, shedding light on the role that inner speech may play in this developmental relationship. Based on the available evidence that systematically suggests collaborative argumentation prompts knowledge gains through a singular developmental trend, the paper aims to develop a theoretical hypothesis to specifically orient future critical empirical research in order to advance understanding on the matter.

First, I will present the empirical evidence that suggests the existence of delayed effects of collaborative group-work argumentation on disciplinary content knowledge, both increased and/or maintained over time (for the notion of maintenance as a delayed effect, see the meta-analysis of [Guzzetti, Snyder, Glass, & Gamas, 1993](#)). Then I will discuss the available accounts on the effect of peer argumentation on disciplinary content knowledge gains and introduce the question of whether the different benefits of peer argumentation (conceptual and linguistic) are intertwined. In what follows I introduce and discuss Vygotsky's notion of inner speech in order to formulate a new account for the delayed effects of collaborative argumentation on content knowledge construction.

2. Reported effects of collaborative group argumentation on conceptual development

The delayed effects of instructional practices are precisely part of the most important educational goals: to promote long-term learning processes that go beyond immediate simple recalling. In the field of collaborative group work, many studies have focused on the effect of collaborative argumentation on linguistic and reasoning outcomes, finding significant effects ([Anderson et al., 2001](#); [Kuhn & Crowell, 2011](#); [Kuhn, Shaw, & Felton, 1997](#); [Kuhn & Udell, 2003](#); [Wegerif, Mercer, & Dawes, 1999](#)). Regarding the effect of peer argumentation on disciplinary content knowledge, experimental studies have found immediate gains on disciplinary knowledge associated with the use of argumentation among peers ([Felton, García-Mila, & Gilabert, 2009](#); [Schwarz, Neuman, & Biezuner, 2000](#)). However, a meta-analysis conducted by [Wecker and Fisher \(2014\)](#) failed to find significant immediate effects of argumentation interventions on domain-specific knowledge in computer-supported collaborative learning settings. There is recognition that the available evidence regarding peer argumentation and content disciplinary learning is not sufficient and more causal studies are required (see [Asterhan & Schwarz, 2016](#)).

Some experimental studies suggest the existence of delayed effects of collaborative argumentation on disciplinary content knowledge. Many of these studies (but not all) come from the research of Christine Howe and colleagues, who have measured content knowledge outcomes of group collaboration using delayed post-tests, relating them to dialogue variations. This group of studies tells a consistent story that requires further consideration and research: the effect of collaborative discussions on conceptual gains is differentially evident only some weeks after collaboration. This does not imply that there are no immediate effects after collaboration, but that discussions may not be differentially effective at immediate post-tests, compared to other types of dialogue or collaborative interaction that also have immediate effects. What the evidence shows, therefore, is that the difference between argumentative and non-argumentative groups is more likely to be statistically significant after some weeks. Here the evidence is mixed: some studies show ([Asterhan & Schwarz, 2007](#); [Rivard & Straw, 2000](#)) that the delayed difference is due to a combination of a decrease in content knowledge measures in non-argumentative groups (Scenario D, [Fig. 1](#)), and maintenance in argumentative groups (Scenario A, [Fig. 1](#)); other studies show ([Howe et al., 2005](#); [Roy & Howe, 1990](#); [Tolmie et al., 1993](#)) that the delayed difference is related to a combination of a decrease in content knowledge measures in non-argumentative groups (Scenario D, [Fig. 1](#)), and a post-collaborative increase in argumentative groups (Scenario B and C, [Fig. 1](#)). Nonetheless, what both types of evidence show is that collaborative argumentation (compared to non-argumentative collaboration) promotes content knowledge in a different way, suggesting that different learning processes may be in place.

For instance, [Roy and Howe \(1990\)](#) conducted an experimental study to investigate the effects of cognitive conflict, socio-cognitive conflict and imitation on socio-legal thinking, based on 107 students between 9 and 12 years of age. They had three conditions: socio-cognitive conflict; cognitive conflict; and a control group. Students were divided into lows and intermediates based on their scores in the pre-test, and were paired and assigned to one of the three conditions. With the socio-cognitive condition, dyads were given questions in which they had disagreed on the pre-test, and were asked to discuss and agree; in the cognitive conflict condition they were presented with conflicting statements and were asked to accept or reject them and explain their decision to their partners; and in the control condition students had to answer questions. Students participated in individual interviews as pre- and post-tests (immediately after the intervention and several weeks later). In the interviews they had to answer four questions regarding six vignettes describing a character transgressing a law (for instance, *Do you think it is wrong or right? Why?*). The questions were intended to grasp the level of socio-legal thinking (heteronomous–socioeconomic; absolutism–non-absolutism; recognition of consequences–intentions; and perception of mutability of laws). The results showed that students in the experimental conditions improved significantly more than students in the control condition from pre- to post-immediate, and from pre- to post-delayed. There was no effect of post-test (no significant differences between post-tests), suggesting that students maintained their immediate gains at a high level of reasoning several weeks later (Scenario A), significantly more than the control group students (who did not progress at all). Extended modes of reasoning present in both experimental conditions, as agreement with conflicting positions, and disagreements and rejections, were systematically and significantly correlated with both immediate and delayed gains.

[Tolmie et al. \(1993\)](#) conducted an experimental study whose aim was to evaluate the relationship between task design, dialogue and conceptual understanding of 'floating' and 'sinking'. In this study 143 students between 8 and 12 years of age participated in pre- and four-weeks-delayed post-tests and a collaboration task. Pre- and post-measures consisted of individual interviews in which children were asked to predict and justify for each of eight everyday objects whether they would sink or float in a tank of water. Of the sample, 25% participated in an additional delayed post-test 11 weeks after the collaborative task. Justification responses from

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