



Epistemic beliefs and comprehension in the context of reading multiple documents: Examining the role of conflict



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ABSTRACT

Tenth-graders responded to questionnaires assessing beliefs concerning the justification of knowledge claims in science and the certainty/simplicity of knowledge about a particular scientific issue. Students in an experimental group, who read multiple conflicting documents concerning the issue of sun exposure and health, changed their domain-specific beliefs concerning personal justification and justification by multiple sources as well as their topic-specific beliefs concerning the certainty/simplicity of knowledge, whereas no such changes were observed in a control group, reading multiple consistent documents on the same issue. Moreover, students in the experimental group outperformed students in the control group on a measure of multiple-documents comprehension. Findings are considered in light of the existing literature on the change of epistemic beliefs and multiple-documents comprehension.

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1. Introduction

Within educational psychology, beliefs about knowledge and knowing, that is, epistemic beliefs, have been linked to motivation, cognition, and academic performance (Bendixen & Feucht, 2010; Hofer & Pintrich, 2002; Khine, 2008). This study aims to contribute to the literature in this area by investigating students' epistemic beliefs in the context of reading multiple documents on a scientific issue. In doing this, we built on the philosophically grounded proposal of Greene, Azevedo, and Torney-Purta (2008), assessing a system of beliefs including different means of justifying knowledge claims as well as beliefs concerning the certainty and simplicity of knowledge. Specifically, we wanted to investigate whether beliefs within these dimensions might be changed by having students read multiple documents discussing contrasting perspectives on an unsettled issue. At the same time, we addressed whether such reading might also lead to better, more integrated comprehension of the issue discussed in the documents than the reading of consistent information on the same issue. By focusing on adolescent readers, we hoped to provide new insight into how pre-undergraduate students respond to a complex task context representing essential aspects of "new literacies" (Leu, Kinzer, Coiro, Castek, & Henry, 2013). Because our participants read multiple documents on the personally relevant, controversial social-scientific issue of sun exposure and potential health risks, our study also examined epistemic beliefs and comprehension in relation to authentic dilemmas of justification and knowledge construction.

1.1. Epistemic beliefs

The study of knowledge and knowing originated as a branch of philosophy. In the past several decades, educational and developmental psychologists have become increasingly interested in beliefs about knowledge and knowing held by

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students; yet philosophical and psychological approaches have mostly proceeded on parallel rather than intertwined paths (Chinn, Buckland, & Samarapungavan, 2011). Recently, however, Greene et al. (2008) urged psychologists to pay more attention to how this construct is addressed by philosophers, proposing a re-definition of the psychology of epistemic beliefs that incorporates important ideas derived from philosophical epistemology.

Essentially, Greene et al. (2008) argued that a closer look at philosophical epistemology necessitates a focus on how claims can be justified as knowledge, with philosophical epistemology identifying a number of different sources, both internal and external to the individual, which can be used to justify knowledge claims. More specifically, Greene et al. (2008) differentiated between one dimension concerning justification by an authoritative source and one dimension concerning justification by a personal source. Using confirmatory factor analysis with a large sample ranging from middle-school through graduate school, Greene, Torney-Purta, and Azevedo (2010) provided preliminary evidence for separate domain-specific (in math and history) epistemic dimensions concerning justification by authority and personal justification. In addition, they found support for a dimension concerning beliefs about the simplicity and certainty of knowledge. It should be noted, however, that this dimension was termed ontological rather than epistemic by Greene et al. (2008), Greene, Torney-Purta et al. (2010), because they considered such beliefs to concern the nature and attributes of classifications of knowledge within particular domains.

Inspired by the Greene et al. (2008) conceptualization, Ferguson, Bråten, and Strømsø (2012) recently used think-aloud methodology to investigate education undergraduates' epistemic cognition during the reading of multiple authentic documents on the controversial issue of cell phone radiation and potential health risks. Consistent with Greene et al.'s (2008) model, epistemic cognition regarding the scientific topic was represented by two dimensions concerning the justification for knowing, that is, justification by authority and personal justification. In addition, a third dimension referring to justification for knowing was identified in the verbal protocols, with this dimension involving that students considered which claims to believe on the basis of cross-checking, comparing, and corroborating across several sources of information. Of note is that this form of justification is also highlighted in research on multiple-documents literacy, with corroboration across multiple sources characterizing expert and competent readers (Afflerbach & Cho, 2009). In the Ferguson et al. (2012) study, one combined certainty/simplicity of knowledge dimension also emerged, supporting not only Greene et al.'s (2008) conceptualization but also other empirical work (Greene, Torney-Purta et al., 2010; Hofer, 2000; Qian & Alvermann, 1995). Ferguson et al. (2012) refrained from excluding the certainty/simplicity dimension from the epistemic realm, however, given that such beliefs refer to the classification of knowledge and that the process of justification centers on classifying knowledge as certain and factual (see also, Bromme, Kienhues, & Stahl, 2008; Chinn et al., 2011; Trautwein & Lüdtke, 2007). We continue this line of research by targeting several dimensions of justification for knowing in the domain of science while also considering epistemic beliefs about the certainty/simplicity of knowledge at a topic-specific level.

1.2. Changes in epistemic beliefs

Developmental and educational psychologists interested in epistemic beliefs agree that epistemic beliefs may change due to individuals' interactions with the socio-cultural context, both within and outside an academic setting (e.g., Kuhn & Weinstock, 2002; Muis, Bendixen, & Haerle, 2006). According to Kuhn, Cheney, and Weinstock (2000), for example, this development begins with an absolutist or dualist view where knowledge is viewed as either right or wrong and where it is possible to know what is right with certainty. This is followed by a period of multiplicity where multiple conflicting views are acknowledged and accepted as equally valid. Finally, a more evaluativistic perspective develops where individuals acknowledge that there is no absolutely certain knowledge but still believe it is possible to evaluate competing knowledge claims and justify claims through the use of supporting evidence. It has been suggested, moreover, that the development of epistemic beliefs may occur along distinct dimensions of beliefs (Bendixen & Rule, 2004; Greene et al., 2008). In addition, there is preliminary evidence suggesting that epistemic beliefs may change as a result of particular interventions where individuals encounter conflicting perspectives on an unsettled issue that challenge their current epistemic beliefs (Barzilai & Zohar, 2012; Ferguson & Bråten, 2013; Ferguson et al., 2012; Gill, Ashton, & Algina, 2004; Kienhues, Bromme, & Stahl, 2008; Kienhues, Stadtler, & Bromme, 2011; Porsch & Bromme, 2011; Tsai, 2008; Valanides & Angeli, 2005). In the following, we briefly review this work.

In a study where American pre-service teachers read a refutational text that challenged their pre-existing views for 15-min, Gill et al. (2004) found that participants altered their beliefs towards a more constructivist view of teaching and learning in mathematics. Prior to reading, participants' attention was directed towards information in the text that conflicted with their pre-existing views. Of note is, however, that Gill et al. targeted beliefs about teaching and learning rather than beliefs concerning knowledge and the process of knowing.

Valanides and Angeli (2005) conducted a study where American undergraduates read a text presenting opposing views on a controversial social science topic and then discussed the text content, reflected on their thinking about the issue, and evaluated their thinking in light of principles for critical thinking. Before the intervention, participants had not fully reached a multiplicitist stage of epistemic cognition whereas they after the 65-min intervention showed some evidence of epistemic beliefs beyond that stage.

Tsai (2008) studied Taiwanese high-school students working on Internet-based inquiry tasks, searching the Internet to resolve controversial science issues as well as participating in online discussions concerning those issues. Over a period of one month, students improved their standards for evaluating online information and developed more adaptive epistemic

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