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Citation for published version (APA):

Van Strien, J., Brand-Gruwel, S., & Boshuizen, E. (2012). *Do prior attitudes influence epistemic cognition while reading conflicting information?*. Paper presented at EARLI SIG 02 , Grenoble, France.

Document status and date:

Published: 10/09/2012

Document Version:

Peer reviewed version

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
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- The final published version features the final layout of the paper including the volume, issue and page numbers.

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Do Prior Attitudes Influence Epistemic Cognition While Reading Conflicting Information?

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Abstract. Students spontaneously engage in epistemic cognition when reading conflicting scientific information. This study examines how this epistemic cognition is related to students' actual beliefs. In addition, the interplay of students' epistemic beliefs and prior attitudes when encountering conflicting and partly attitude-inconsistent information on a controversial socio-scientific is studied using think-aloud methods.

Keywords: Epistemic cognition; prior attitudes; conflicting information; multiple texts

Introduction

Students are often confronted with conflicting information on controversial socio-scientific topics when searching for information on the Internet. Such topics are characterised by the existence of competing theories and points of view for which there is no simple conclusion (Kobayashi, 2009).

Epistemic Cognition in Action

Epistemic cognition pertains to the processes involved in defining, acquiring, and using knowledge (Greene, Azevedo, & Torney-Putra, 2008), and includes metacognitive thinking about the nature of knowledge and justification for knowing (Mason, Boldrin, & Ariasi, 2010). Previous work has demonstrated that university students (Ferguson, Bråten, & Strømsø, 2012) as well upper level secondary school students (Mason, Ariasi, & Boldrin, 2011) spontaneously engage in epistemic cognition when reading multiple texts on controversial topics. That is, students verbalize epistemic reflections regarding the source of knowledge, justification of knowledge, simplicity and complexity of knowledge, and certainty and uncertainty of knowledge.

Interplay of Epistemic Beliefs and Prior Attitudes

In current models of epistemic cognition, the willingness to adjust beliefs is emphasized. Bendixen and Rule's (2004) model, for instance, includes among other things mechanisms of change. This starts with epistemic doubt, i.e., questioning one's beliefs, and requires epistemic volition, or the willingness to adapt these beliefs. Finally, resolution strategies are necessary to overcome doubt.

Yet, learners' prior attitudes may prevent learners from giving in to epistemic doubt or to undertake actions to change their beliefs. For instance, learners with strong prior attitudes may display a disconfirmation bias, i.e., a tendency to spend more time on and allocate more cognitive effort to information that is inconsistent with their attitudes and beliefs, while quickly and uncritically accepting information that supports these attitudes (Taber & Lodge, 2006). This could mean that

students may be more inclined to see themselves as source of knowledge, but also that they are more critical of the status of attitude-inconsistent knowledge claims.

Research Question and Hypotheses

As prior attitudes can thus strongly bias information processing, it is interesting to know how prior attitudes and epistemic cognition interact. The following research question were addressed: How do prior attitudes towards climate change influence students' epistemic cognition when reading multiple texts containing conflicting information? In this study, participants were classified as holding either predominantly multiplist or evaluativist epistemic beliefs. At the multiplist level, people become aware of the uncertain and subjective nature of knowledge and knowing. However, this awareness overrules any objective standards for the evaluation of information. As a consequence, all opinions are deemed equally valuable and right. At the evaluativist level, uncertainty is acknowledged, but without ignoring the importance of evaluation of knowledge claims. That is, two positions can both be right, but one can be better supported by evidence, making it more valuable (Kuhn, 1999).

It should be expected that students holding evaluativist epistemic beliefs would act according to these beliefs and come to the conclusion that their prior attitudes may not be right. However, if prior attitudes prevail, students should – irrespective of their epistemic beliefs –attach greater value to the information that is consistent with these attitudes than to information that is in line with scientific evidence and, as a consequence, more reliable. Students with evaluativist beliefs should act according to their epistemic beliefs, as could be evidenced by more epistemic reflections regarding justification of knowledge claims by authority, regarding the justification of knowledge claims by multiple sources, (Ferguson et al., 2012). Multiplists, on the other hand, are expected to verbalize more epistemic reflections regarding personal justification of knowledge claims (Ferguson et al., 2012).

Methods

Participants

Participants were 25 11th grade students from a Dutch secondary school for pre-university education.

Measures

Prior attitudes on climate change were measured with a 12-item questionnaire ($\alpha = .84$) developed for this study. Epistemic beliefs were measured using a modified version of a questionnaire previously validated among 11th grade students, which distinguishes between multiplism and evaluativism (Van Strien, Bijker, Brand-Gruwel, & Boshuizen, 2012; $\alpha = .64$ for both scales). Utterances in think-aloud protocols were coded based on Ferguson et al. (2012), who distinguished between utterances reflecting certainly/simplicity of knowledge, justification by authority, personal justification, or justification by means of multiple sources.

Materials

Participants read 16 texts on the evidence for man-made global warming. Half of the texts describes the insights from climate science as agreed on by the vast majority of climate scientists, whereas the other half challenges these views and contains information from less reliable sources.

Procedure

In a first session, 98 students from 11th grade filled in the prior attitudes measure and the epistemic beliefs questionnaire. Based on the outcomes, 25 students (12 boys; 13 girls) were selected to

participate in a follow-up study. Participants were divided into one of two conditions depending on their prior attitudes. One condition consisted of students with sceptic attitudes toward climate change. The second condition consisted of students with neutral prior attitudes. In each group, participants had divergent scores on evaluativism and multiplism. During the individual session participants read a number of pre-selected texts on climate change while thinking aloud, and are asked to answer a short essay question. Participants were given 30 minutes to complete the task.

Results and Discussion

Preliminary analyses using the coarse-grained coding scheme showed no significant differences in the relative number of utterances regarding certainty/simplicity of knowledge ($t(23) = 0.26, p = .799$), justification by authority ($t(23) = 0.18, p = .857$), personal justification ($t(23) = -0.02, p = .981$), nor justification by means of multiple sources ($t(23) = -0.51, p = .612$) between sceptics and students holding neutral attitudes. In general, students produced only a small proportion of utterances regarding justification of knowledge by authority ($M = 0.072, SD = 0.060$), but a relatively large proportion of utterances regarding personal justification ($M = 0.45, SD = 0.12$), with most participants paying only little attention to source information. These preliminary results might imply that students have difficulties with objectively and adequately evaluating information regardless of their prior attitudes. More fine-grained analyses are planned to gain a more detailed view of students' responses to conflicting, partly attitude-inconsistent information as a function of their prior attitudes and epistemic beliefs. For instance, case studies of eight students with either pronounced evaluativist or multiplist beliefs suggest that among sceptics, those holding multiplist beliefs may be less inclined to justify knowledge claims using multiple sources than those holding evaluativist beliefs.

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