Biased Representations of Controversial Information: Certainty and Justification Beliefs as Moderators

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Abstract

Pre-existing beliefs bias mental representations of socio-scientific controversies in favour of the perspective(s) that endorse(s) them. Several conditions have been proposed to moderate such belief-biased mental representations of controversial information. The present study examined the effects of readers' prior beliefs on their mental models of textual information on the level of situation-model and text-base representations. The study further investigated the extent that author status, readers' certainty and justification beliefs moderate the effect of prior beliefs on the readers' representations. Sixty-two undergraduate students of English as a foreign language read two texts that provided arguments for and against an established controversy in language education. A recognition task was used to assess their situation-model and text-base strengths. The results revealed that readers' representations were biased towards the information that supported their beliefs at the level of the situation model but not at the level of the text-base. The results further revealed no main or moderating effects for author status on the interaction of beliefs and readers' mental models of the information. However, readers' certainty beliefs and beliefs about justification for knowing were shown to moderate the belief-biased representation of the controversial information.

Keywords: pre-existing beliefs, text representation, epistemic beliefs, author status

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Beliefs as Moderators

People often read information about controversial socio-scientific issues (Wolfe et al., 2013), ranging from global issues, such as energy consumption, deforestation, or global warming, to more national issues such as gun control in the USA, abolishing the Electoral College, or integration of immigrants in Germany. Numerous controversies also abound in different disciplines and discourse communities, which are debated actively among the members. A case in point in L2 education is the controversy surrounding grammar instruction, represented by the polar positions—inductive approach vs. deductive approach. The former refers to an instructional approach in which learners are presented with examples and are required to induce the underlying rules whereas the latter refers to an approach in which grammatical rules are presented first and are then practiced in drills (Jean & Simard, 2013). Previous research has provided little evidence for a consensus of one approach being more efficacious than the other (Tammenga-Helmantel et al., 2016). Consequently, the controversy continues to attract attention in the field, and L2 students and teachers can find numerous sources that support one or the other position.

The prevalence of Internet-based information documentation has facilitated the circulation of and access to such controversial information (Stadtler et al., 2014; Wang et al., 2020). In such a literacy context, searching through a wealth of sources that present conflicting information and constructing balanced representations of the information has become increasingly important. However, evidence accumulates that readers tend to favor information that endorses their pre-existing beliefs and ignore information that invalidates them (Kardash & Scholes, 1996; Kessler et al., 2019; Richter, 2015). According to this research, readers often use their pre-existing beliefs as signposts to guide them in selecting, interpreting, and processing information (Maier & Richter, 2013). Consequently, the result

would be a biased mental representation of the controversial information (Britt et al., 1999) or a type of "case building [defined as] the justification of a pre-drawn conclusion as opposed to the impartial evaluation of evidence to arrive at an unbiased conclusion" (McCrudden & Sparks, 2014, p. 1).

A number of conditions have been proposed to guard against belief biases in representations, such as the perceived level of trust in the information source, awareness of argument structures, reading goals, and prior knowledge (Richter & Maier, 2018; Hart et al., 2009; Kessler et al., 2019; Wolfe et al., 2013). Additionally, readers' epistemic beliefs have been cited as individual variables that are likely to moderate the effect of beliefs on the mental representations of controversial information (Richter & Maier, 2017; Strømsø et al., 2016). In the light of the background presented, this study investigated the extent that L2 students' pre-existing beliefs on the grammar instruction controversy interacts with their mental representations of the information that either supports or opposes their beliefs. The study also investigated the extent that author status—native vs. non-native—and readers' beliefs about the certainty of knowledge as well as their beliefs regarding the justification for knowing by multiple sources moderate the representation-belief interaction while reading multiple controversial documents.

We briefly discuss the theoretical underpinnings of belief-biased representations of controversial information followed by a review of the extant empirical studies on the issue. We then discuss the role of readers' epistemic beliefs in text representation and present our study hypotheses.

Text Representation and Prior Beliefs: Conceptual Underpinnings

The role of readers' prior beliefs in forming the mental representations they construct of the textual information has been emphasized in a number of theoretical accounts of text comprehension. Based on the selective exposure effect (Festinger, 1957) and the congeniality

bias (Eagly & Chaiken, 1993), readers tend to bolster their beliefs by choosing to be selectively exposed to information that supports them and ignore information that discredits them (Hart et al., 2009).

In their Multiple Documents–Task-Based Relevance Assessment and Content Extraction (MD-TRACE) model, Rouet and Britt (2011) view reading as a goal-driven activity that readers accomplish by recruiting a set of external and internal resources. Among the readers' internal resources, are prior knowledge and beliefs, which are assumed to have a direct bearing on how they pursue and evaluate the initial representations of the goals they construct to deal with the text(s) and a specification of how they would achieve the goals (labelled task model). This reliance on internal resources is further highlighted in the RESOLV (REading as problem SOLVing) model (Rouet et al., 2017), as an extension to the MD-TRACE model. The model views reading as a purposeful activity that occurs "within a physical and social context that sets conditions and resources for reading" (Rouet et al., 2017, p. 203). According to this model, readers' schematic plans to satisfy task model demands are based on a benefit-cost ratio analysis by which "readers evaluate the physical, cognitive, and emotional cost relative to the benefits of reading actions with respect to achieving their goals" (Rouet et al., p. 203). In this process, readers are likely to rely on their beliefs as resources, which regulates their cognitive processing while reading conflicting information by expending less cognitive resources on information that is inconsistent with their beliefs (Abendroth & Richter, 2021, 2021).

Another theoretical framework that capitalizes on this idea and that is directly relevant for the present research, is the Two-Step Model of Validation (Richter & Maier, 2017). This model makes specific assumptions about how beliefs affect the comprehension of multiple documents with conflicting information. The model proposes two major steps that are involved in comprehending textual information including validation (epistemic monitoring),

and elaborative processing. As a default, readers tend to rely on validation as a routine, non-strategic component of comprehension during which readers constantly evaluate the consistency of the incoming textual information with their prior beliefs, which function as epistemic gatekeepers. Similar to the System I processing mode (Kahneman, 2011), this step operates in a quick and automatic fashion and requires little conscious effort. Reliance on this step is typical of reading situations in which readers follow no specific reading goals or are not epistemically curious or motivated. As a consequence of reliance on this non-strategic comprehension process, readers choose not to repair likely disruptions in reading that are caused by the inconsistencies between their prior beliefs and the textual information (Abendroth & Richter, 2020a). This condition leads to a tendency to continue to read without attempting to integrate belief-incompatible information in the mental model that they construct of the controversial documents.

In a second strategic process, readers attempt to resolve the inconsistencies between their prior beliefs and the textual information. In contrast to the validation stage in which readers tend to ignore belief-inconsistent information, in the elaborative processing stage, readers attend to and actively pursue the incompatibilities they detect between their prior beliefs and the textual information (Richter & Maier, 2017). Elaboration of belief-inconsistent information is, however, an optional, resource-intensive and goal-driven step that requires more cognitive resources, a higher level of metacognitive awareness, and a higher amount of prior knowledge (Abendroth & Richter, 2021). This step resonates with the System II mode of processing (Kahneman, 2011) in that it involves complex mental computations and a sense of agency and choice about what to think about and how to process it. To guard against the belief-biased representation of controversial information, readers need to reduce their mere reliance on the default validation process and engage in elaborative

processing of belief-inconsistent information. Failure to engage in such elaborative processing would yield a biased representation of the information.

Pre-existing beliefs and text representation

The validation process posited in the Two-Step Model (Richter & Maier, 2017) leads to text-belief consistency effects as a natural by-product of the routine process of validation (Maier & Richter, 2014; O'Brien & Cook, 2016). The text-belief consistency effect is an already established effect in the literature on text comprehension and has gathered support from several lines of research with different outcome measurements.

The first line of research that supports the effect relates to information evaluation. For example, in their classic study, Lord et al. (1979) investigated how pre-existing attitudes influence readers' judgments on two studies that ostensibly provided evidence for or against the deterrent effect of capital punishment. They found that participants judged the belief-supporting study as more convincing and were less critical of the study procedures. In contrast, they rated the belief-inconsistent study as less convincing and more poorly conducted.

The text-belief consistency effect is also supported by the line of research that has focused on how beliefs change when readers are exposed to text(s) that aim to refute common misconceptions about a specific topic. For example, Kessler et al. (2019) investigated how participants revise accurate and inaccurate prior beliefs after they read a relevant refutational text. The findings provided evidence for the text-belief consistency effect. Participants' prior beliefs about the topic predicted their post-reading beliefs, assessed both immediately and with some delay. The authors concluded that participants might have approached the refutational text with an intention to preserve their prior beliefs.

The same effect has been found in studies that required participants to synthesize across multiple, often Web-based controversial, documents. In one such study, van Strien et

al. (2014) investigated how participants with strong pre-existing attitudes draw partial conclusions after they read a range of controversial texts. The findings indicated that participants with weak prior attitudes wrote essays reflecting the inconclusive nature of the controversy. In contrast, participants that held stronger prior attitudes tended to adopt a stance that was compatible with their pre-existing attitudes. Participants were found to include less information from the sources that they were assigned to read. Nonetheless, they tended to include a substantial number of attitude-congruent arguments that they formulated irrespective of the content of the texts. Similar findings were reported by van Strien et al. (2016) who found that participants with strong attitudes about organic foods tended to include more arguments from attitude-congruent websites into their essays.

Another line of research on the text-belief consistency effect, directly relevant to the aims of the present study, has focused on how participants construct text-base and situation models based on multiple controversial documents. Within this line of research, the text-belief consistency effect is assumed to be linked more closely to the situation-model construction, which proposes that readers establish associations between text-external (e.g., general world knowledge and beliefs) and text-internal (e.g., words, sentences, and larger text segments), compared with the text-base model, which involves an organized collection of the propositions conveyed by a text (Stine-Morrow & Radvansky, 2018). This assumption was tested in Maier and Richter (2013) that investigated how participants construct situation-model and text-base representations of belief-consistent and belief-inconsistent information. As hypothesized, the results demonstrated a text-belief consistency effect at the situation-model representation level. The authors further reported a reverse text-belief consistency at the level of text-base representation (memory was stronger for specific belief-inconsistent text information). However, to our knowledge, this reverse text-belief consistency effect on the level of text-base representation has not been replicated.

The text-belief consistency effect has been found to function as a defensive mechanism for the readers to enhance cognitive consistency and curb cognitive dissonance. This was supported in a study by Maier, Richter, Nauroth, et al. (2018) who investigated how pre-existing beliefs and group identification influence mental representations of controversial information that was either socially affirming or threatening. The findings revealed that for participants who identified with a particular social group, belief-inconsistent information might come across as a threat to individual beliefs and their social identity. Therefore, the text-belief consistency effect that they display functions as a defense motivation mechanism to reduce the dissonance that they experience at the individual and social level.

In an attempt to cross-validate the findings of this line of research among populations other than university students, Abendroth and Richter (2020a) also investigated the effect among upper high school students. Similar to findings from other studies, participants constructed better situation models for the belief-consistent information compared with the belief-inconsistent information. Finally, Abendroth and Richter (2020b) showed that belief-biases also occur with experimentally induced beliefs. They used texts about a scientific controversy unfamiliar to the university students who participated in the experiment (medical use of spider silk) and induced pro- or contra-beliefs prior to reading with a 7-min video. Again, readers' situation models were biased towards the beliefs induced by the video manipulation, and the effect of beliefs on comprehension was mediated by the perceived plausibility of the information conveyed in the text.

Epistemic beliefs and text representation

Epistemic beliefs are defined as views that individuals hold about knowledge and knowing (Kerwer & Rosman, 2018; Karimi, 2014). The link between epistemic beliefs and text comprehension gained attention before the turn of the century (Bråten et al., 2013). The first studies on this issue had focused on epistemic beliefs in relation to single-text

comprehension. For example, beliefs about the certainty and simplicity of knowledge, as two dimensions within the multidimensional frameworks of epistemic beliefs (Hofer & Pintrich, 1997; Schommer, 1990), were found to predict single-text interpretation and comprehension (Buehl & Alexander, 2005; Kardash & Scholes, 1996; Schommer, 1990; Schommer & Walker, 1995; Schraw et al., 2002).

With the proliferation of information sources in the digital information society and the ensuing intertextual practices, the theory and research on multiple documents flourished (Bråten et al., 2013). Within this context, the importance of linking epistemic beliefs and multiple-texts comprehension gained gradual recognition. Central to this line of research is the assumption that to build effective integrated representations based on information from multiple documents, readers need to develop epistemic dispositions that knowledge should be constructed through rational processes and based on a synthesis of information from multiple, at times, conflicting sources (Stahl et al., 1996). In terms of the Two-Step Model of Validation (Richter & Maier, 2017), this goal requires readers to engage in the epistemic elaboration of conflicting information in the documents. According to the model, a well-developed epistemic stance "makes it more likely that learners follow an epistemic learning goal which, in turn, is a precondition for epistemic elaboration [of belief-inconsistent information]" (Richter, 2011, p. 135). Belief in the changing and fallible nature of knowledge especially makes it less likely that the readers will view texts as sources that provide unquestionable information, which increases their attention to source information in the face of con. Furthermore, the significance of the link between epistemic beliefs and multiple-texts comprehension is highlighted even within the more recent alternative frameworks proposed for these beliefs. Arguing that epistemology should focus more on how knowledge claims are justified, Green et al. (2008) proposed a model that emphasized the primacy of justification in conceptualizations of epistemology. In this model, which was an integration of dimensional

and developmental models of epistemic beliefs (Green, Cartiff et al., 2018), the justification dimension in Hofer and Pintrich's (1997) framework was expanded to include the sub-dimensions of justification by authority and justification by personal experience. Building on the work by Greene and colleagues, Ferguson et al. (2012) added a third dimension that they called justification for knowing by multiple sources. This dimension is highly relevant in the context of reading multiple documents as an example of an ill-structured learning domain, which by nature involves cross-checking overlapping or divergent sources for the purpose of verifying or disconfirming knowledge claims (Strømsø et al., 2016). Additionally, the tendency to justify knowledge claims across several sources could reduce the biased representation of controversial information and guard against the text-belief consistency effect by giving readers the chance to check alternative accounts of controversial topics.

The link between dimensions of epistemic beliefs and multiple-texts comprehension has been empirically supported. For example, Strømsø et al. (2008) found evidence for a link between beliefs about the certainty of knowledge and comprehending multiple texts. Readers who believed in the tentative and evolving nature of knowledge about the topic discussed in the texts were more likely to show a better performance on the intertextual comprehension measure compared with readers who believed in the fixed and absolute nature of knowledge about the same topic. Bråten and Strømsø (2009) reported similar results in a study that investigated reading outcomes based on a measure of undergraduate students' intertextual understanding when instructed to imagine writing arguments (argument condition) or to provide summaries (summary condition). Participants who believed in the certain and unchanging nature of knowledge about climate change showed poorer learning outcomes compared with the students who believed that such knowledge was tentative and evolving.

Strømsø and Bråten (2009), arguing that evidence showing the link between justification beliefs and text comprehension was lacking, investigated the link between these

beliefs and multiple-text comprehension among upper secondary school students. The results showed that students who believed that knowledge claims should be justified through rules of inquiry and should be based on evaluation and integration of evidence across multiple documents comprehended the texts better. The indirect effect of justification by multiple sources on multiple-texts comprehension through the mediation of effort and deep-level strategies was also reported in Bråten et al. (2014). Similarly, arguing that very few studies have investigated the relationship between justification beliefs and text comprehension, Strømsø et al. (2016) examined the link between beliefs about justification for knowing and comprehending multiple conflicting texts among ethnic minority and ethnic majority students. The results revealed differences across the ethnic groups. More specifically, although none of the categories of justification beliefs was shown to uniquely predict comprehension of multiple texts, the interactions between two of the justification beliefs and students' ethnic background predicted learning from and comprehending the texts. For the ethnic minority participants, beliefs in the justification for knowing by authority facilitated their comprehension of multiple texts, whereas no such association was found among the ethnic majority participants. Likewise, in two studies involving protocol data, Greene et al. (2014) and Greene, Copeland et al. (2018) found that the more that university students justified knowledge propositions by checking their consistency with other relevant propositions while engaged in a Web search on a health-related topic (vitamins), the better their learning from multiple digital sources and their comprehension outcomes.

In another study, Ferguson and Bråten (2013) categorized participants into clusters based on their prior topical knowledge and justification beliefs and examined their learning from multiple sources on a scientific issue. The findings showed that the subgroup of participants who possessed high levels of prior knowledge but low levels of personal

justification beliefs and who also strongly believed in justification by multiple sources performed the best on a measure of multiple-text comprehension.

Native/Non-Native Status as a Credibility Cue

Source characteristics, whether related to "the content … [or] the content's messenger" (Lombardi, et al., 2014, p. 77) have been documented to affect the plausibility of texticual information (Wertgen, et al., 2021). Credibility, as it relates to the content's messenger, concerns the extent to which a speaker is perceived to be capable of or willing to making correct assertions (Pornpitakpan, 2004, p. 244). These two aspects of credibility may be termed expertise and trustworthiness, both of which have been reported to affect representations of textual information (Bråten et al., 2019; Goldman et al., 2012; Wertgen, et al., 2021).

In the present paper, we focus on the expertise dimension of credibility reflected in the dichotomy between native and non-native speakers. In language education, native speakers are assumed to be ideal language models and to embody 'superior' principles for language teaching methodology compared with non-native speakers (Holliday, 2006). The assumption is rooted in a Chomskyan representation of the idealized speaker-listener whose advanced language skills are not affected by grammatically irrelevant conditions such as memory constraints, distractions, and random or characteristic errors in translating language competence into performance (Chomsky, 1965). The influence of the concept stretched beyond theoretical linguistics and was soon embraced in cognitivism-oriented second language acquisition research, which set the native speaker as the benchmark for language acquisition (Selvi, 2014).

Initially based on the superiority of native speakers in language competence, the assumption was expanded to include issues of teaching methodology, cultural competence, and instructional materials. For example, students and parents have been reported to perceive

native-speaking teachers as superior to their non-native counterparts (e.g., Colmenero & Lasagabaster, 2020; Lasagabaster & Sierra, 2010). In essence, the pedagogy of language education that emanates out of universities in the native-speaking world has long been assumed to be the most effective one and "teachers in other countries and other cultures have been assured that this one is the correct one, and that their role is to adapt it to their learners, or their learners to it" (Kumaravadivelu, 2006, p. 20).

Despite the development of localized varieties of English and the multicultural nature of today's English and the copious attempts to problematize native-speakerism (Swan, et al., 2015), the concept still continues to dominate the field of L2 education. Native L2 professionals are still regarded as superior sources of pedagogical ideas, and numerous non-native EFL students and even professionals look up to them for the most forward-looking methodological approaches and principles.

The Current Research

Previous research converges on the role of prior beliefs in the way readers approach controversial texts and its effect on comprehension outcomes. In detail, the evidence suggests that beliefs bias the representations of such texts mostly in favor of the perspectives that support them rather than (aim to) invalidate them. In line with the evidence from previous research, we predicted that L2 students would display a text-belief consistency effect at the level of situation-model representation when reading pro-stance and contra-stance documents on a language teaching controversy (Hypothesis 1).

Several conditions have been proposed to moderate the effects of beliefs on readers' representations of controversial information by encouraging readers to engage in elaborative processing of belief-incompatible information. One such factor is trust in and perceived expertise of the source of the information (Lombardi et al., 2014). As discussed above, these trust and expertise judgements are clearly seen in L2 education, for example, when a native

speaker, mostly by virtue of a sophisticated language competence, has been accorded an assumed authority and expertise not only in language but also extending to other domains such as pedagogical ideas and instructional materials (Kumaravadivelu, 2012). Therefore, we predicted that the text-belief consistency effect would enhance comprehension, that is, lead to stronger situation models for the texts authored by native scholars compared to non-native scholars (Hypothesis 2a) and that the text-belief consistency effect would be cancelled out when both texts were presented as authored by a native scholar (Hypothesis 2b).

Epistemic beliefs have also been assumed to guard against the text-belief consistency effect in reading controversial information. As posited by Richter (2011) and Richter and Maier (2017), an epistemic position that acknowledges that knowledge is fallible and changing and that knowledge claims must be backed up by appropriate justification might lead readers to follow specific reading goals and engage in elaborative processing of information that is incompatible with their beliefs. However, despite these theoretical acknowledgements, little empirical evidence has reported on the moderating role of epistemic beliefs in readers' belief-biased representations when they read multiple controversial texts on a single topic. In this light, we predicted that beliefs about the certainty of knowledge would moderate the text-belief consistency effect at the level of situation-model representation (Hypothesis 3a). Similarly, we predicted that beliefs about justification for knowing by multiple sources would moderate the text-belief consistency effect at the level of situation-model representation (Hypothesis 3b).

We further explored whether the text-belief consistency effect occurs for the text-base representation. The effect at the text-base representation level is explained by competing theories. For example, according to the schema-pointer-plus-tag model (Graesser, 1981), atypical items are likely to be tagged in the memory trace, which are likely to be represented through a distinct memory code (Cohen, 1982). Given the atypical nature of belief-

inconsistent information, it might be represented better in memory. Additionally, based on the predictions of the reverse coherence effect (McNamara, et al., 1996), comprehending a text is less likely to proceed equally well at the text-base and situation-model representation levels. In contrast, readers' self-monitoring behaviors are assumed to be complicated when comprehension proceeds well at the text-base representation level. Consequently, the reader might register sufficient progress at the text-base representation level and fail to construct a sophisticated representation at the situation-model level. Parallel theoretical ideas also support the assumption that reading is a primarily bottom-up process and that layering a sophisticated situation-model representation on a weakly constructed text-base model is not possible. In sum, both perspectives are theoretically justified. Therefore, we opted for an exploratory question instead of a hypothesis. Likewise, the lack of evidence for reverse text-belief consistency effects at the text-base representation level in previous studies (except for Maier & Richter, 2013) prevented us from forming hypotheses.

Method

Participants and Text-Belief Consistency Manipulation Check

An initial sample ($N = 91$) of undergraduate students of English as a foreign language (EFL) responded to a prior beliefs measure that assessed their beliefs about the superiority of inductive (pro-stance) vs. deductive (contra-stance) approaches to grammar instruction in L2 education (see the section on the prior beliefs measure). Participants were Iranian and their first language was Persian. They used English for their studies at the university. Prior to attending a university, Iranian students study English as one of their subjects in junior high school and high school. Some students also attend private language institutions to learn the language. Based on their performance on the measure, the general means for the pro-stance and contra-stance items were computed (pro-stance: $M = 3.98$, $SD = 0.74$; contra-stance: $M = 2.51$, $SD = 0.89$). Participants ($n = 62$; gender: 32 males, 30 females; age: $M = 20.84$ years,

SD = 2.67 years) whose scores on the pro-stance items fell above the general pro-stance mean and whose scores on the contra-stance items fell below the general contra-stance mean were selected to take part in the experiment proper. These participants agreed more strongly with the position of the text that argued for the effectiveness of the inductive approach to grammar instruction (*M* = 4.26, *SD* = 0.31, ratings on a scale from 1 *(strongly disagree)* to 5 *(strongly agree)*). They, however, agreed less strongly with the position of the text that argued for the effectiveness of the deductive approach to grammar instruction (*M* = 2.09, *SD* = 0.46, ratings on a scale from 1 *(strongly disagree)* to 5 *(strongly agree)*). These participants' agreements to the pro and contra argumentative positions differed significantly and strongly from each other, $t(61) = 26.05$, $p < .001$, $d = 3.31$. Moreover, their agreements to the two argumentative positions were significantly different from the theoretical midpoint (3.00) of the response scale (pro argumentative position: $t(61) = 32.28$, $p < .001$, $d = 4.01$; contra argumentative position: $t(61) = -15.46$, $p < .001$, $d = 1.96$).

From the participants who were excluded from the target sample by not meeting the inclusion criteria, six agreed either identically or quite similarly (varied by merely 0.25 of a point from each other) to the two argumentative positions, four participants agreed more strongly with the contra argumentative position, 14 participant mean scores for the two argumentative positions fell either above or below one or both of the computed overall means of the two positions, and four participants failed to appear for the experiment proper and one participant responded to only one set of the items on the prior beliefs measure.

Materials and Measures

Text Material

Two experimental texts presented opposing perspectives on an established controversy in L2 education—the comparative effectiveness of inductive vs. deductive approaches to grammar instruction. The texts, which were in English, were created based on

excerpts from various sources including materials from publicly accessible websites, journal

extracts, and textbooks. One text argued in favor of the inductive approach to grammar

instruction (pro-position, consistent with participants' prior beliefs), and the other text

presented arguments that supported the deductive approach to grammar instruction (contra-

position, inconsistent with participants' prior beliefs). Each text started with an introduction

composed of two paragraphs that framed the controversy and quickly stated the central idea

of the text. Subsequently, four major arguments were presented, each through a separate sub-

heading. Each argument consisted of a central claim followed by supporting statements that,

together, presented cumulative support for the text's major claim. The text ended with a

sentential conclusion of the argument.

The mean length of the two texts was 937 words and their mean readability was 43.80

(based on the Flesch Reading Ease formula; Flesch, 1948) indicating that the texts were

moderately difficult but appropriate for college students. To further ensure that the two texts

were comparable in content, an independent sample of undergraduate students ($N = 18$) with

the same characteristics as the target participants were asked to read and rate them with

respect to level of understandability, interestingness, perceived argument plausibility, clarity

of stance towards the issue, and the number of arguments presented (see Table 1 for a

summary of text ratings). Multiple matched-samples t-tests were conducted to detect likely

differences across the texts for the five characteristics. The results revealed no significant

differences between the texts.

Comprehension Measure

A recognition task modelled after Schmalhofer and Glavanov (1986) was used to

measure the participants' situation-model and text-base representations of each text. The

measure consisted of three types of items including paraphrases, inferences, and distractors

(eight items per item type). To construct a paraphrase, an original statement from the text was

rephrased by changing the syntactic arrangement of the words and replacing key lexical items with synonyms. Therefore, the information expressed in a paraphrase item was explicitly provided in the text. In contrast, an inference item contained information that readers were required to infer from the text to build an appropriate situation model of the text content. Finally, a distractor item contained information that was neither explicitly provided in the text nor could be sensibly inferred from the texts. However, distractors had superficial overlaps with the text content. Participants' responses to paraphrase items and inference items were used as a basis for assessing the strengths of the text-base and situation-model representations, respectively. The participants' scores on these items were corrected for response tendencies. In detail, the probit-transformed proportions of incorrect responses to distractor items (false alarms) were subtracted from the probit-transformed proportions of correct responses to inference items (hits) to yield a measure for the situation-model strength. Similarly, the probit-transformed proportions of incorrect responses to distractor items (false alarms) were subtracted from the probit-transformed proportions of correct responses to paraphrase items (hits) to yield a measure for text-base representation strength.

Prior Beliefs Measure

Participants' prior beliefs about the controversy discussed in the texts were assessed by an 8-item beliefs measure. Four items were used to assess the participants' agreement with the pro argumentative position on the controversy (e.g., 'I think the inductive approach is a better approach to grammar instruction as it is more learner-centered'). Similarly, four other items were used to assess the participants' agreement with the contra position on the controversy (e.g., 'I believe grammar is best taught through deductive teaching unlike other language components such as vocabulary and pronunciation'). Response categories for the items on the scale ranged from 1 *(strongly disagree)* to 5 *(strongly agree)*. The internal consistency for both sets of items on the measure were acceptable (items measuring the pro

argumentative position: Cronbach's α = .83; items measuring the contra argumentative

position: Cronbach's α = .82).

Measures of Beliefs about the Certainty of Knowledge and Justification for Knowing

Beliefs about the certainty of knowledge were measured using six items from the 32-

item epistemic beliefs inventory by Schraw et al. (1995). Participants were required to

express their agreement to each item on a scale ranging from 1 (*Strongly Disagree*) to 6

(*Strongly Agree*). Three of the items were reverse-scored. The total scores on the measure

ranged from 6 to 36. Lower scores on the measure reflected views that knowledge is tentative

and evolving, whereas higher scores on the measure indicated views that knowledge is fixed

and unchanging. The internal consistency (Cronbach's α) of the measure in the present study

was .71.

The measure for beliefs about the justification for knowing by multiple sources used

in the present study was based on the Justification for Knowing Questionnaire (JFK-Q)

designed by Ferguson et al. (2013). The authors developed the questionnaire based on Greene

et al.'s (2008) conceptualization of justification for knowing. Originally, the measure is

domain-specific and all items pertain to natural sciences. For the purpose of the present study,

only the five items that assessed justification for knowing by multiple sources were used. The

items were adapted to reflect general tendencies while reading scientific texts. For example,

the original item 'I can never be sure about a claim in natural science until I have checked it

with at least one other source' was adapted to 'I can never be sure about a claim in a text until

I have checked it with at least one other source'. Participants were required to express their

agreement to each item on a scale ranging from 1 (*Strongly Disagree*) to 6 (*Strongly Agree*).

The total scores on the measure ranged from 5 to 30. Lower scores on the measure reflected

weaker beliefs, whereas higher scores reflected stronger beliefs about justification by

multiple sources. The internal consistency (Cronbach's α) of the measure was .78.

Procedure

To prevent carry-over effects, the prior beliefs measure was administered five weeks prior to the main experiment. For the main experiment, the two texts were given to the participants in a paper-and-pencil test format. They were instructed to read each text and respond to the items on the comprehension measure that followed. The name of the author was given directly below the text title and a quick reference to the status of the author (whether the author was a native or a non-native professional) was also provided in the second introductory paragraph. While responding to the items on the comprehension measure, the participants were informed that they were not allowed to refer back to the texts. Two versions of the comprehension measure—varied with regard to question order—were constructed for each text to control for the likely effects of question order. Half of the participants received version A of the comprehension measure and the other half received version B of the measure. Additionally, the presentation sequence of the two texts varied across the participants. Half the participants received the belief-consistent text first and then the belief-inconsistent text, and the other half received the two texts in the opposite order. The time allocated to reading the texts and responding to the items on the comprehension measure was 60 min.

Design

The core design of the study was a 2 (text-belief consistency: belief-consistent vs. belief-inconsistent; varied within-subjects) × 2 (author stance: native vs. non-native; varied between-subjects) mixed design. In addition, text sequence and question order were counterbalanced between participants. Beliefs about the certainty of knowledge (z-standardized) and beliefs about justification for knowing by multiple sources (z-standardized) were included as covariates.

Availability of Materials and Data

The texts, test items, data, and the associated analysis scripts can be accessed in the

repository of the Open Science Framework (OSF,

https://osf.io/mbw7r/?view_only=d9501e3d9bc1407283775f5633461232).

Results

The current study investigated the text-belief consistency effect in L2 readers while

reading controversial information. Descriptive statistics and intercorrelations of the variables

under study are reported in Table 2. In addition, the mean proportions of responses to the

comprehension items (per item type)—per author status and overall—are reported in Table 3.

All hypothesis tests were based on a Type I error probability of .05 (two-tailed).

To compute the post-hoc power for the given sample size and the study design, we

assumed a medium effect size ($f = .25$) and medium correlations ($\rho = .5$) between the levels

of the independent variables. The power ($1-\beta$) for testing the interaction of author status and

text-belief consistency was computed to be .99 (computed with G∗Power 3.1.9.4 software;

Faul et al., 2007).

Question order and text sequence exerted no significant effects on the strength of the

participants' situation-model and text-base representations. Accordingly, these variables were

not included in the main analyses.

Confirmatory Analyses of Effects on Situation-Model Strength

Hypothesis 1 predicted that participants would display text-belief consistency effects

at the situation-model representation level while reading the controversial documents. More

specifically, we predicted that participants would construct stronger situation models for the

belief-consistent text compared with the situation models for the belief-inconsistent text. The

results of a General Linear Model analysis revealed a significant difference in the strength of

the situation models for the two texts, $F(1, 58) = 7.62$, $p = .008$, $\eta_p^2 = 0.12$. In line with the

hypothesis, participants' situation models for the belief-consistent text ($M = 2.29$, $SE = 0.09$)

were stronger than the situation models for the belief-inconsistent text ($M = 2.03$, $SE = 0.08$) (Figure 1).

Hypothesis 2 predicted that participants' situation model would be stronger for texts with native-speaker authors compared with non-native speakers (Hypothesis 2a) and that the text-belief consistency effect would disappear when texts were presented as coming from native scholars compared with non-native scholars (Hypothesis 2b). No significant difference was found in the strength of the situation models for the native-authored and non-native-authored texts, $F(1, 58) = 2.03$, $p = .159$, and author status had no moderating effect on the text-belief consistency effect, $F(1, 58) = 0.015$, $p = .903$. Thus, no evidence was found for a main effect of author status (sensu Hypothesis 2a) or a moderating effect of author status on the text-belief consistency effect on the level of the situation-model representation (sensu Hypothesis 2b).

We further predicted that participants' beliefs about the certainty of knowledge (Hypothesis 3a) and beliefs about justification for knowing by multiple sources (Hypothesis 3b) moderate the text-belief consistency effect on the situation-model representation level. In line with the predictions of Hypothesis 3, the interactions of the two types of epistemic beliefs and the participants' situation-model strength were significant (beliefs about the certainty of knowledge: $F(1, 58) = 4.81$, $p = .032$, $\eta_p^2 = 0.08$; beliefs about justification for knowing by multiple sources: $F(1, 58) = 8.65$, $p = .005$, $\eta_p^2 = 0.13$).

To interpret the interactions relevant for Hypothesis 3, we estimated conditional effects of text-belief consistency for participants with higher levels (+1 SD) and lower levels (–1 SD) of beliefs about the certainty of knowledge and justification for knowing by multiple sources to interpret the interaction of these two sets of beliefs and the text-belief consistency effect (Aiken & West, 1991; for the case of interactions of covariates with within-subject factors, see Judd, et al., 2001). Participants with higher levels of beliefs about the certainty of

knowledge constructed stronger situation models for the belief-consistent text ($M = 2.24$, $SE = 0.12$) compared with the situation models for the belief-inconsistent text ($M = 1.77$, $SE = 0.11$), $F(1, 58) = 12.31$, $p < .001$, $\eta_p^2 = 0.18$). In contrast, the situation models for the belief-consistent ($M = 2.34$, $SE = 0.12$) and belief-inconsistent texts were on par in participants with lower levels of beliefs about the certainty of knowledge ($M = 2.29$, $SE = 0.11$), $F(1, 58) = .136$, $p = .713$.

Participants with higher levels of beliefs about justification for knowing by multiple sources also constructed similar situation models for the belief-consistent ($M = 2.20$, $SE = 0.12$) and belief-inconsistent texts ($M = 2.21$, $SE = 0.11$), $F(1, 58) = .021$, $p = .886$. In contrast, participants with lower levels of these beliefs constructed stronger situation models for the belief-consistent text ($M = 2.39$, $SE = 0.12$) compared with the situation models for the belief-inconsistent text ($M = 1.84$, $SE = 0.11$), $F(1, 58) = 16.24$, $p < .001$, $\eta_p^2 = 0.22$. In sum, low levels of certainty beliefs and high levels of justification-by-multiple-sources beliefs counteracted the text-belief consistency effect.

Follow-up analyses on the simple slopes of beliefs about the certainty of knowledge and justification for knowing by multiple sources for the belief-consistent and belief-inconsistent texts shed further light on the interaction. These analyses revealed that the slopes of certainty beliefs, $\beta = -.38$, $t = -3.30$, $p = .002$, $\Delta R^2 = .14$, and beliefs about justification for knowing by multiple sources, $\beta = .27$, $t = 2.34$ $p = .023$, $\Delta R^2 = .07$, were significant in the belief-inconsistent text. However, neither of the two simple slopes were significant in the belief-consistent text (certainty beliefs: $\beta = -.08$, $t = -0.59$, $p = .559$; beliefs about justification for knowing by multiple source: $\beta = -.15$, $t = -1.13$, $p = .264$). Thus, epistemic beliefs affected comprehension for the belief-inconsistent text but no evidence was found for effects on comprehension for the belief-consistent text.

Exploratory Analyses of Effects on the Strength of the Text-Base Representation

No main effect of text-belief consistency on the strength of the participants' text-base representations was found, $F(1, 58) = 1.11$, $p = .297$. Participants constructed a similarly strong text-base for the belief-consistent text ($M = 2.36$, $SE = 0.09$) and the belief-inconsistent text ($M = 2.46$, $SE = 0.08$) (Figure 1). Similarly, no main effect, $F(1, 58) = 2.17$, $p = .146$, and no interaction with text-belief consistency, $F(1, 58) = .405$, $p = .527$, was found for author status on the level of text-base representation.

We also explored whether epistemic beliefs interact with text-belief consistency. The interaction of certainty beliefs with text-belief consistency was not significant, $F(1,58) = 0.29$, $p = .593$, but the interaction of beliefs about the justification for knowing by multiple sources with text-belief consistency was significant, $F(1,58) = 4.53$, $p = .038$, $\eta_p^2 = 0.07$. The pattern of the interaction differed from the interaction found for the situation-model representation. At a low level of beliefs about justification for knowing by multiple sources (-1 SD), the text-base representation was stronger for the belief-inconsistent text ($M = 2.58$, $SE = 0.11$) compared with the belief-consistent text ($M = 2.27$, $SE = 0.12$), $F(1,58) = 5.08$, $p = .028$, $\eta_p^2 = 0.08$. At a high level of beliefs about justification for knowing by multiple sources ($+1$ SD), no difference was found in the text-base strengths for the belief-consistent ($M = 2.45$, $SE = 0.12$) and the belief-inconsistent texts ($M = 2.35$, $SE = 0.11$), $F(1,58) = 0.59$, $p = .444$. Thus, a reverse text-belief consistency effect emerged for participants with only a relatively weak endorsement of the belief that knowledge requires justification by multiple sources.

Discussion

The present study examined the text-belief consistency effect on the situation-model and text-base representation levels in participants that read documents presenting opposing perspectives about an L2 education controversy (i.e., grammar instruction: inductive or deductive?). Additionally, the study investigated whether author status (native vs. non-native)

affects and moderates the strength of the situation-model and text-base representations and the extent that beliefs about the certainty of knowledge and justification for knowing by multiple sources affect the strength of the situation-model representation and moderate the text-belief consistency effect at this level of representation. The results revealed that readers' situation-model representation of the controversy was biased towards the pro-stance text. However, a text-belief consistency effect was not found on the level of text-base representation. Author status was also not found to either affect the participants' situation-model strength or moderate the effect of prior beliefs on text representation at the situation-model and text-base levels. The results further revealed a moderating effect for beliefs about the certainty of knowledge on the situation-model strength and a moderating effect for beliefs about justification for knowing by multiple sources on the situation-model and text-base representations.

The reported belief bias in the mental representation of a scientific controversy was in the range of medium effects (according to the effect size conventions proposed by Cohen, 1988) and thus similar to the effect sizes found in most previous studies on the text-belief consistency effect (Richter & Maier, 2017). This finding provides further support for the assumption that readers tend to construct a message representation that is aligned with their prior beliefs and might be attained with minimum cognitive effort (Abendroth & Richter, 2021; Ferreira et al., 2002). Readers tend to rely on their pre-existing beliefs as epistemic background to choose certain information for more profound processing (Authors, 2021). This reliance on prior beliefs is likely to reduce the strain on readers' cognitive resources by leading them to expend less cognitive effort on processing belief-incompatible information compared with belief-compatible information (Maier, Richter, & Britt, 2018). According to the Two-Step Model of Validation (Richter & Maier, 2017), this belief-driven representation and the ensuing meager cognitive investment in processing belief-incompatible information

stems from a routine validation process in comprehension (Richter, 2015; Singer, 2013). The default outcome of validation integrates information that is judged as more plausible (i.e., more truthful in relation to the readers' pre-existing beliefs and the contents of their evolving mental models; Lombardi et al., 2013) into the situation-model representations of the textual information while disregarding the information that is judged as less plausible. Consequently, readers' mental representations of controversies is often belief-biased and stance-driven (Richter & Maier, 2017).

The results, however, provided no evidence for a text-belief consistency effect at the text-base representation level. According to the schema-copy-plus-tag model (Graesser, 1981; Graesser & Nakamura, 1982), a reader comprehends textual information by identifying a generic schema that aligns with the main theme of the text. This general schema provides a basis for memory representation such that items that are relevant to the generic schema are copied into the memory representation, whereas items that are atypical of the schema are not represented in the schematic portion but are connected to the memory representation through a unique tag (Schmidt & Sherman, 1984). Additionally, the reverse coherence effect (McNamara et al., 1996) provides justification for disproportionate comprehension at the text-base and situation-model representation levels. Based on this assumption, comprehension is conceptualized in terms of a two-level representation, including the text-base and the situation-model representations. Readers' comprehension is assumed to differ at these two levels. Therefore, they are more likely to comprehend a text satisfactorily at the text-base representation level, which complicates their monitoring behaviors and prevents them from achieving a sophisticated situation-model representation (McNamara et al., 1996). In contrast, readers are equally likely to be informed from their inadequate comprehension at the text-base representation level to actively pursue text-knowledge associations to construct a sophisticated situation-model representation (McNamara et al., 1996). These two scenarios

may lead to a pattern of opposite effects such that an improvement in readers' situation-model representation is likely to impair the text-base representation. In the context of reading multiple controversial documents that present belief-compatible and belief-incompatible perspectives, this pattern might lead to a better text-base representation of the contra-stance information (the reverse text-belief consistency effect; Maier & Richter, 2013). The results of the present study, however, yielded no evidence for a reverse text-belief consistency effect at the text-base representation level and thus provides no support for such theoretical predictions.

The results further revealed no main or moderating effect for author status on the participants' situation-model strength. The trust and expertise associated with native speakers is clearly observed in L2 education. Mostly by virtue of a more sophisticated language competence, native speakers have been accorded an assumed authority and expertise, which has moved beyond the linguistic performance to other domains such as pedagogy, evaluation, and materials preparation (Kumaravadivelu, 2012). Therefore, we expected stronger situation-model representations for the texts authored by native scholars than the texts authored by non-native scholars. The results, however, revealed no support for this prediction. One possible reason for these unexpected results could be that despite the theoretical discussions around the superiority of native speakers over their non-native counterparts with regard to expertise in L2 pedagogy, the undergraduate students in the present study might not have viewed the two groups as significantly different from each other. A more likely explanation could be that participants ignored the author credentials and merely focused on the content of the texts. Disregarding source information and failing to make objective judgements of the reliability and accuracy of controversial documents and the likely biases therein has been a consistent finding in previous research on text comprehension

(Bråten et al., 2019; Bråten et al., 2016; Kiili et al., 2008; Stadtler et al., 2013). The lack of effects for author status was also replicated at the text-base representation level.

A further finding of the study was the moderating effect found for beliefs about the certainty of knowledge and justification for knowing by multiple sources on the text-belief consistency effect at the situation-model representation level. This is in line with the predictions of the Two-Step Model of Validation, which cites epistemic beliefs as factors that are likely to modulate the impact of pre-existing beliefs on the mental representations of controversial information (Richter, 2015; Richter & Maier, 2017). A point of particular note regarding the moderating effect of the two sets of epistemic beliefs on the text-belief consistency effect at the situation-model representation level relates to the way these beliefs were shown to moderate the effect. The two sets of beliefs were found to significantly affect the situation-model representation of the contra-stance text with a moderate medium to large effect but not the situation-model representation of the pro-stance text. A likely explanation for this differential effect relates to the interaction between the participants' pre-existing beliefs about the topic of the texts and their epistemic beliefs in comprehending the pro-stance and contra-stance texts. According to the RESOLV model (Rouet et al., 2017), cues from the reading task lead readers to create specific task models that guide their subsequent (sub)goal(s) and the set of activities planned to achieve these goals—referred to as activity models (Wiley et al., 2018). Epistemic beliefs are assumed to inform the activity model as a component of the broader task model, and cues from the reading task are likely to affect the epistemic beliefs that need to be activated (Rouet et al., 2017; Wiley et al., 2020). Thus, a plausible argument is that pro-stance and contra-stance texts may differentially affect the epistemic beliefs that need to be activated and the extent that they are invoked in the representation of information in such texts. Given that a text presents arguments that support pre-existing beliefs, readers may not find it necessary to activate certain epistemic beliefs,

including certainty beliefs or the tendency to cross-validate the arguments against other relevant propositions or sources. In contrast, the arguments in a contra-stance document are more likely to lead readers, particularly readers with more sophisticated epistemic beliefs, to activate their epistemic dispositions to revise their pre-existing beliefs about a topic and create a more balanced mental representation of the contra-stance document.

In the analyses on the level of text-base representation, no moderating effect was found for beliefs about the certainty of knowledge on the text-belief consistency effect. These results suggest that text-base representation may not be belief-driven. Surprisingly, the results revealed a moderating effect for beliefs about justification for knowing by multiple sources on the text-base representation and a reverse text-belief consistency effect for participants that did not highly endorse the view that knowledge requires justification by multiple sources. This unexpected finding might have been confounded by the high correlation between the situation-model and the text-base representations for each text. This effect could be examined further in future research to examine whether it can be replicated.

Limitations

In the present study, we included only two texts. Including more belief-consistent and belief-inconsistent texts would have added to the generalizability and informativeness of the findings. A higher number of texts would also allow for the more varied presentation of the texts such as the block-by-block vs. the interleaved presentation of the documents to investigate the associated effects. Additionally, both texts focused on a single topic, which prevented the authors from controlling for the likely effects associated with text topic. We also neglected to include a manipulation check to assess whether participants noticed the author information and how they interpreted it. Furthermore, the participants agreed with one side of the controversy, which resulted in an imbalanced design. This imbalanced designs has also been used in previous research. Including participants that endorse either side of the

controversy and a subsample that adopts a neutral stance on the topic would have been a clear advantage for the present study. Moreover, the comprehension measure used in the study focused on individual texts, which was consistent with previous research on the text-belief consistency effect. The results would have been more promising if the focus of the measure had been widened to include information integration across the documents. Finally, the epistemic beliefs were measured at a domain-general level. This choice was based on the Two-Step Model of Validation (Richter, 2011; Richter & Maier, 2017), which assumes that readers' general subjective epistemology, independent of the specific domain, affects whether readers engage in epistemic elaboration and thus the magnitude of the text-belief consistency effect. In fact, the hypotheses on the modulating effects of certainty and justification beliefs, which were based on this premise, received support in the present study. However, researchers have convincingly argued that epistemic beliefs may vary from domain to domain and should be assessed as domain-specific epistemic beliefs (e.g., Muis, et al., 2006). Therefore, further research should address the question whether similar results are obtained when epistemic beliefs are assessed in a domain-specific manner. Our expectation would be that assessing certainty and justification beliefs as domain-specific beliefs might even increase their moderating effect.

Conclusion

The present study extends research on the text-belief consistency effect in text comprehension in two ways. First, the study enhances the rather constrained generalizability of the findings from previous research that focused entirely on selective samples of German and North American students. The present study was conducted with a sample of participants in a different cultural and instructional setting. Additionally, the study provided empirical evidence regarding the moderating effect of epistemic beliefs on the text-belief consistency effect. Despite the theoretical discussions (e.g., Richter & Maier, 2017; 2018), little empirical

evidence supports the moderating effect of epistemic beliefs on the text-belief consistency effect in reading multiple controversial documents. The findings support the theoretical assumption that differences in epistemic dispositions affect the way information from multiple documents is represented. For example, the moderating effects of certainty beliefs and justification by multiple sources on the text-belief consistency effect suggest that readers are likely to adopt goals, as part of their task model (Wiley et al., 2020), that determine their representation of the controversy (e.g., should the representation only reflect the content of the document(s) that align with readers' prior beliefs as fixed unquestionable answers to the controversy, or should the representation also include alternative accounts of the controversy presented in other documents, which may not necessarily accord with their beliefs).

The results of the study provide further evidence that readers' mental representations of socioscientific controversies are biased towards their pre-existing beliefs. Readers tend to use their beliefs as epistemic background to select and process the information that supports their viewpoints and avoid information that can potentially discredit their prior beliefs (Abendroth & Richter, 2021; Knobloch-Westerwick & Meng, 2011). Given that their mental representations prepares them for situated action, readers should represent the controversial information they encounter as accurately as possible (Schroeder, et al., 2008). In this light, we strongly advise that instructional programs should raise readers' awareness of the belief-biased representation of the state of affairs described in multiple controversial texts on a single topic. Given the moderating effect of epistemic beliefs on the representation of controversial information in the present study, instructional programs should also consider cultivating sophisticated epistemic dispositions in readers. Evidence suggests that epistemic beliefs can be taught and developed through experience with multiple-texts inquiry tasks (Wiley et al., 2020), particularly tasks that require cross-checking conflicting information

across sources. Fostering such dispositions can encourage readers to detect and elaboratively

resolve text-belief inconsistencies and engage in strategic validation processes.

References

Abendroth, J. & Richter, T. (2020). Text-belief consistency effects in adolescents' comprehension of multiple documents from the Web. *Journal for the Study of Education and Development, 43*(1), 60–100. https://doi.org/10.1080/ 02103702.2019.1692289

Abendroth, J. & Richter, T. (2021). How to understand what you don't believe: Metacognitive training prevents belief-biases in multiple text comprehension. *Learning and Instruction, 71*, 101394. https://doi.org/10.1016/j.learninstruc.2020.101394

Aiken, L. S. & West, S. G. (1991). *Multiple regression: Testing and interpreting interaction*s. Thousand Oaks, CA: Sage.

Bråten, I., Anmarkrud, Ø., Brandmo, C., & Strømsø, H. I. (2014). Developing and testing a model of direct and indirect relationships between individual differences, processing, and multiple-text comprehension. *Learning and Instruction, 30,* 9–24. https://doi.org/10.1016/j.learninstruc.2013.11.002

Bråten, I., Brante, E. W., & Strømsø, H. I. (2019). Teaching sourcing in upper-secondary school: A comprehensive sourcing intervention with follow-up data. *Reading Research Quarterly, 54*(4), 481–505. https://doi.org/10.1002/rrq.253

Bråten, I., & Strømsø, H. I. (2009). Effects of task instruction and personal epistemology on the understanding of multiple texts about climate change. *Discourse Processes, 47*(1), 1–31. https://doi.org/10.1080/01638530902959646

Bråten, I., Strømsø, H. I., & Andreassen, R. (2016). Sourcing in professional education: Do text factors make any difference? *Reading and Writing, 29*(8)*,* 1599–1628. https://doi.org/10.1007/s11145-015-9611-y

Britt, M. A., Perfetti, C. A., Sandak, R., & Rouet, J. F. (1999). Content integration and source separation in learning from multiple texts. In S. R. Goldman, A. C. Graesser, & P. van

den Broek (Eds.), *Narrative comprehension, causality, and coherence: Essays in honor of Tom Trabasso* (pp. 209–233). Mahwah, NJ: Erlbaum.

Buehl, M. M., & Alexander, P. A. (2005). Motivation and performance differences in students' domain specific epistemological belief profiles. *American Educational Research Journal, 42*(4), 697–726. https://doi.org/10.3102/00028312042004697

Chomsky, N. (1965). *Aspects of the theory of syntax*. Cambridge, Massachusetts: MIT Press.

Cohen, J (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Colmenero, K., & Lasagabaster, D. (2020). Enclosing native speakerism: Students', parents' and teachers' perceptions of language teachers. *Journal of Multilingual and Multicultural Development.* Advance online publication. https://doi.org/10.1080/01434632.2020.1865384

Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes.* Harcourt Brace Jovanovich College Publishers.

Festinger, L. (1957). *A theory of cognitive dissonance.* Stanford University Press.

Faul, F., Erdfelder, E., Lang, A. -G., & Buchner, A. (2007). G∗power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191. 10.3758/bf03193146

Ferguson, L. E., & Bråten, I. (2013). Student profiles of knowledge and epistemic beliefs: Changes and relations to multiple-text comprehension. *Learning and Instruction, 25*, 49–61. https://doi.org/10.1016/j.learninstruc.2012.11.003

Ferguson, L. E., Bråten, I., & Strømsø, H. I. (2012). Epistemic cognition when students read multiple documents containing conflicting scientific evidence: A think-aloud study. *Learning & Instruction, 22*(2), 103–120. https://doi.org/10.1016/j.learninstruc.2011.08.002

Ferguson, L. E., Bråten, I., Strømsø, H. I., & Anmarkrud, Ø. (2013). Epistemic beliefs and comprehension in the context of reading multiple documents: Examining the role of conflict. *International Journal of Educational Research, 62,* 100–114. https://doi.org/10.1016/j.ijer.2013.07.001

Ferreira, F., Bailey, K. G., & Ferraro, V. (2002). Good-enough representations in language comprehension. *Current Directions in Psychological Science, 11*(1), 11–15. https://doi.org/10.1111/1467-8721.00158

Flesch, R. (1948). A new readability yardstick. *Journal of Applied Psychology, 32*(3), 221–233. https://doi.org/10.1037/h0057532

Goldman, S. R., Braasch, J. L., Wiley, J., Graesser, A. C., & Brodowinska, K. (2012). Comprehending and learning from Internet sources: Processing patterns of better and poorer learners. *Reading Research Quarterly, 47*(4), 356–381. https://doi.org/10.1002/RRQ.027

Graesser, A. C. (1981). *Prose comprehension beyond the word.* New York, NY: Springer.

Graesser, A., & Nakamura, G. V. (1982). The impact of schema on comprehension and memory. In G. R. Bower (Ed.), *The psychology of learning and motivation*. New York: Academic Press.

Greene, J. A., Azevedo, R., & Torney-Purta, J. (2008). Modeling epistemic and ontological cognition: Philosophical perspectives and methodological directions. *Educational Psychologist, 43*(3), 142–160. https://doi.org/10.1080/00461520802178458

Greene, J. A., Cartiff, B. M., & Duke, R. F. (2018). A meta-analytic review of the relationship between epistemic cognition and academic achievement. *Journal of Educational Psychology, 110*(8), 1084–1111. https://doi.org/10.1037/edu0000312

Greene, J. A., Copeland, D. Z., Deekens, V. M., & Yu, S. B. (2018). Beyond knowledge: Examining digital literacy's role in the acquisition of understanding in science.

Computers & Education, 117, 141–159.

https://doi.org/10.1016/j.compedu.2017.10.003

Greene, J. A., Yu, S. B., & Copeland, D. Z. (2014). Measuring critical components of digital

literacy and their relationships with learning. *Computers & Education*, *76*, 55–69.

https://doi.org/10.1016/j.compedu.2014.03.008

Hart, W., Eagly, A. H., Lindberg, M. J., Albarraccin, D., Brechan, I., & Merrill, L. (2009).

Feeling validated versus being correct: A meta-analysis of selective exposure to

information. *Psychological Bulletin, 135*(4), 555–588. 10.1037/a0015701

Holliday, A. (2006). Native-speakerism. *ELT Journal, 60*(4), 385–387.

https://doi.org/10.1093/elt/ccl030

Jean, G., & Simard, D. (2013). Deductive versus inductive grammar instruction: Investigating

possible relationships between gains, preferences and learning styles. *System, 4*(4),

1023–1042*.* doi:10.1016/j.system.2013.10.008

Judd, C. M., Kenny, D. A., & McClelland, G. H. (2001). Estimating and testing mediation

and moderation in within-subject designs. *Psychological Methods, 6*(2), 115-134.

10.1037/1082-989x.6.2.115

Karabenick, S. A., & Moosa, S. (2005). Culture and personal epistemology: U.S. and Middle

Eastern students' beliefs about scientific knowledge and knowing. *Social Psychology*

of Education, 8, 375–393. https://doi.org/10.1007/s11218-005-1826-3

Kardash, C. M. C., & Scholes, R. R. J. (1996). Effects of preexisting beliefs, epistemological

beliefs, and need for cognition on interpretation of controversial issues. *Journal of*

Educational Psychology, 88(2), 260–271. https://doi.org/10.1037/0022-0663.88.2.260

Karimi, M. N. (2014). Disciplinary variations in English domain-specific personal

epistemology: Insights from disciplines differing along Biglan's dimensions of

academic domains classification. *System*, *44*, 89–100. DOI: https://doi.org/10.1016/j.system.2014.03.002

Kerwer, M., & Rosman, T. (2018). Mechanisms of epistemic change—Under which circumstances does diverging information support epistemic development? *Frontiers in Psychology, 9,* 2278. https://doi.org/10.3389/fpsyg.2018.02278

Kessler, E. D., Braasch J. L. G., & Kardash, C. M. (2019). Individual differences in revising (and maintaining) accurate and inaccurate beliefs about childhood vaccinations. *Discourse Processes, 56*(5-6), 415–428. https://doi.org/10.1080/0163853X.2019.1596709

Kiili, C., Laurinen, L., & Marttunen, M. (2008). Students evaluating internet sources: From versatile evaluators to uncritical readers. *Journal of Educational Computing Research*, *39*(1), 75–95. https://doi.org/10.2190/EC.39.1.e

Knobloch-Westerwick, S., & Meng, J. (2011). Reinforcement of the political self through selective exposure to political messages. *Journal of Communication, 61*(2), 349–368. https://doi.org/10.1111/j.1460-2466.2011.01543.x

Kumaravadivelu, B. (2006). Dangerous liaison: Globalization, empire and TESOL. In J. Edge (Ed.), *(Re)Locating TESOL in an age of empire* (pp. 1–26). London: Palgrave/Macmillan.

Kumaravadivelu, B. (2012). Individual identity, cultural globalization and teaching English as an international language: The case for an epistemic break. In L. Alsagoff, W. Renandya, G. Hu, & S. L. Mckay (Eds.), *Teaching English as an international language: Principles and practices* (pp. 9–27). New York: Routledge.

Lasagabaster, D., & Sierra, J. M. (2010). University students' perceptions of native and non-native speaker teachers of English. *Language Awareness, 11*(2), 132–142. https://doi.org/10.1080/09658410208667051

Lombardi, D., Seyranian, V., & Sinatra, G. M. (2014). Source effects and plausibility

   judgments when reading about climate change. *Discourse Processes, 51*(1-2), 75–92.

   https://doi.org/10.1080/0163853X.2013.855049

Lombardi, D., Sinatra, G. M., & Nussbaum, E. M. (2013). Plausibility reappraisals and shifts

   in middle school students' climate change conceptions. *Learning and Instruction, 27*,

   50–62. https://doi.org/10.1016/j.learninstruc.2013.03.001

Lord, C. G., Ross, L., & Lepper, M. R. (1979). Biased assimilation and attitude polarization:

   The effects of prior theories on subsequently considered evidence. *Journal of

   Personality and Social Psychology, 37*(11), 2098–2109. https://doi.org/10.1037/0022-

   3514.37.11.2098

Maier, J., & Richter, T. (2013). Text-belief consistency effects in the comprehension of

   multiple texts with conflicting information. *Cognition and Instruction*, *31*(2), 151–

   175. https://doi.org/10.1080/07370008.2013.769997

Maier, J., & Richter, T. (2014). Fostering multiple text comprehension: How metacognitive

   strategies and motivation moderate the text-belief consistency effect. *Metacognition

   & Learning*, *9*(1), 51–74. https://doi.org/10.1007/s11409-013-9111-x

Maier, J., Richter, T., & Britt, M. A. (2018). Cognitive processes underlying the text-belief

   consistency effect: An eye-movement study. *Applied Cognitive Psychology*, *32*(2),

   171–185. https://doi.org/10.1002/acp.3391

Maier, J., Richter, T., Nauroth, P. & Gollwitzer, M. (2018). For me or for them: How in-group

   identification and beliefs influence the comprehension of controversial texts. *Journal

   of Research in Reading, 41*(S1), 48–65. https://doi.org/10.1111/1467-9817.12132

McCrudden, M. T., & Sparks, P. C. (2014). Exploring the effect of task instructions on topic

   beliefs and topic belief justifications: A mixed methods study. *Contemporary

   Educational Psychology, 39*(1)*,* 1–11. https://doi.org/10.1016/j.cedpsych.2013.10.001

McNamara, D. S., Kintsch, E., Songer, N. B., & Kintsch, W. (1996). Are good texts always better? Interactions of text coherence, background knowledge, and levels of understanding in learning from text. *Cognition and Instruction*, *14*(1), 1–43. https://doi.org/10.1207/s1532690xci1401_1

Muis, K. R., Bendixen, L. D., & Haerle, F. C. (2006). Domain-generality and domain-specificity in personal epistemology research: Philosophical and empirical reflections in the development of a theoretical framework. *Educational Psychology Review,* *18*(1), 3-54. https://doi.org/10.1007/s10648-006-9003-6

O'Brien, E. J., & Cook, A. E. (2016). Coherence threshold and the continuity of processing: The RI-Val model of comprehension. *Discourse Processes, 53*(5-6), 326–338. https://doi.org/10.1080/0163853X.2015.1123341

Pornpitakpan, C. (2004). The persuasiveness of source credibility: A critical review of five decades' evidence. *Journal of Applied Social Psychology, 34*(2), 243–281. https://doi.org/10.1111/j.1559-1816.2004.tb02547.x

Richter, T. (2011). Cognitive flexibility and epistemic validation in learning from multiple texts. In J. Elen, E. Stahl, R. Bromme, & G. Clarebout (Eds.), *Links between beliefs and cognitive flexibility* (pp. 125–140). Berlin, Germany: Springer. https://doi.org/10.1007/978-94-007-1793-0_7

Richter, T. (2015). Validation and comprehension of text information: Two sides of the same coin. *Discourse Processes, 52*(5–6), 337–352. https://doi.org/10.1080/0163853X.2015.1025665

Richter, T., & Maier, J. (2017). Comprehension of multiple documents with conflicting information: A two-step model of validation. *Educational Psychologist, 52*(3), 148–166. https://doi.org/10.1080/00461520.2017.1322968

Richter, T., & Maier, J. (2018). The role of validation in multiple documents comprehension. In J. Braasch, I. Bråten, & M. McCrudden (Eds.), Handbook of multiple source use (pp. 151–167). Routledge.

Rouet, J. -F., & Britt, M. A. (2011). Relevance processes in multiple documents comprehension. In M. T. McCrudden, J. P. Magliano, & G. Schraw (Eds.), *Text relevance and learning from text* (pp. 19–52). Charlotte, NC: Information Age.

Rouet, J. -F., Britt, M. A., & Durik, A. M. (2017). RESOLV: Readers' representation of reading contexts and tasks. *Educational Psychologist, 50*(3), 200–215. https://doi.org/10.1080/00461520.2017.1329015

Schmalhofer, F., & Glavanov, D. (1986). Three components of understanding a programmer's manual: Verbatim, propositional, and situational representations. *Journal of Memory and Language*, *25*(3), 279–294. https://doi.org/10.1016/0749-596X(86)90002-1

Schommer, M. (1990). Effects of beliefs about the nature of knowledge on comprehension. *Journal of Educational Psychology, 82*(3), 498–504. https://doi.org/10.1037/0022-0663.82.3.498

Schommer, M., & Walker, K. (1995). Are epistemological beliefs similar across domains? *Journal of Educational Psychology, 87*(3), 424–432. https://doi.org/10.1037/0022-0663.87.3.424

Schommer, M., Crouse, A., & Rhodes, N. (1992). Epistemological beliefs and mathematical text comprehension: Believing it is simple does not make it so. *Journal of Educational Psychology, 84*(4), 435–443. https://doi.org/10.1037/0022-0663.84.4.435

Schraw, G., Bendixen, L. D., & Dunkle, M. E. (2002). Development and validation of the Epistemic Belief Inventory (EBI). In B. K. Hofer, & P. R. Pintrich (Eds.), *Personal*

epistemology: The psychology of beliefs about knowledge and knowing (pp. 261–275). Mahwah, NJ: Erlbaum.

Selvi, A. F. (2014). Myths and misconceptions about the non-native English speakers in TESOL (NNEST) movement. *TESOL Journal, 5*(3), 573–611. https://doi.org/10.1002/tesj.158

Singer, M. (2013). Validation in reading comprehension. *Current Directions in Psychological Science, 22*(5), 361–366. https://doi.org/10.1177/0963721413495236

Stadtler, M., Scharrer, L., Skodzik, T., & Bromme, R. (2014). Comprehending multiple documents on scientific controversies: Effects of reading goals and signaling rhetorical relationships. *Discourse Processes, 51*(1-2), 93–116. https://doi.org/10.1080/0163853X.2013.855535

Stadtler, M., Thomm, E., Babiel, S., Hentschke, J., & Bromme, R. (2013). *Ignorant albeit competent: Examining students' sourcing competencies and spontaneous use of source information while reading conflicting scientific texts.* Paper presented at the Workshop on Multiple Document Literacy, Münster, Germany.

Stine-Morrow, E. A. L., & Radvansky, G. A. (2018). Discourse processing and development through the adult lifespan. In M. F. Schober, D. N. Rapp, & M. A. Britt (Eds.), *The Routledge handbook of discourse processes* (p. 247–268). Routledge/Taylor & Francis Group.

Strømsø, H. I., & Bråten, I. (2009). Beliefs about knowledge and knowing and multiple-text comprehension among upper secondary students. *Educational Psychology, 29*(4), 425–445. https://doi.org/10.1080/01443410903046864

Strømsø, H. I., Bråten, I., Anmarkrud, Ø., & Ferguson, L. E. (2016). Beliefs about justification for knowing when ethnic-majority and ethnic-minority students read multiple conflicting documents. *Educational Psychology: An International Journal of*

Experimental Educational Psychology, 36(4), 638–657.

https://doi.org/10.1080/01443410.2014.920080

Strømsø, H. I., Bråten, I., & Samuelstuen, M. S. (2008). Dimensions of topic-specific

epistemological beliefs as predictors of multiple text understanding. *Learning and*

Instruction, 18(6), 513–527. https://doi.org/10.1016/j.learninstruc.2007.11.001

Swan, A., Aboshiha, P., Holliday, A. (eds), (2015). *(En)countering native-speakerism:*

Global perspectives. Palgrave Macmillan.

Tammenga-Helmantel, M., Bazhutkina, I., Steringa, S., Hummel, I., & Suhre, C. (2016).

Comparing inductive and deductive grammatical instruction in teaching German as a

foreign language in Dutch classrooms. *System, 63*, 101–114.

https://doi.org/10.1016/j.system.2016.09.002

van Strien, J. L. H., Brand-Gruwel, S., & Boshuizen, H. P. A. (2014). Dealing with

conflicting information from multiple nonlinear texts: Effects of prior attitudes.

Computers in Human Behavior, 32, 101–111.

https://doi.org/10.1016/j.chb.2013.11.021

van Strien, J. L. H., Kammerer, Y., Brand-Gruwel, S., & Boshuizen, H. P. A. (2016). How

attitude strength biases information processing and evaluation on the web. *Computers*

in Human Behavior, 60, 245–252. https://doi.org/10.1016/j.chb.2016.02.057

Wang C. -Y., Tsai M. -J., & Tsai C. -C. (2020). Predicting cognitive structures and

information processing modes by eye-tracking when reading controversial reports

about socio-scientific issues. *Computers in Human Behavior, 112*, 106471.

https://doi.org/10.1016/j.chb.2020.106471

Wertgen, A. G., Richter, T., & Rouet, J. -F. (2021). The role of source credibility in the

validation of information depends on the degree of (im)plausibility. *Discourse*

Processes. https://doi.org/10.1080/0163853X.2021.1881342

Wiley, J., Jaeger, A. J., & Griffin, T. D. (2018). Effects of task instructions on comprehension from multiple sources in history and science. In J. L. G. Braasch, I. Braten, & M. T. McCrudden (Eds.). *Handbook of multiple source use* (pp. 341–361). New York, NY: Routledge.

Wiley, J., Griffin, T. D., Steffens, B., & Britt, M. A. (2020). Epistemic beliefs about the value of integrating information across multiple documents in history. *Learning and Instruction, 65*, 101266. https://doi.org/10.1016/j.learninstruc.2019.101266

Wolfe, M. B. W., Tanner, S. M., & Taylor, A. R. (2013). Processing and representation of arguments in one-sided texts about disputed topics. *Discourse Processes, 50*(7), 457–497. https://doi.org/10.1080/0163853X.2013.828480

Table 1

Characteristics of the Two Experimental Texts

Text No.	Argumentative Position	Length[a]	Readability[a]	Plausibility[c] M(SE_M)	Understandability[c] M(SE_M)	Number of arguments[c] M(SE_M)	Clarity of stance[c] M(SE_M)	Interestingness[c] M(SE_M)
Text 1	Pro-Position	939	42.10	4.43 (.17)	4.99 (.11)	3.94 (.10)	4.89 (.25)	4.61 (.28)
Text 2	Contra-Position	935	45.50	4.48 (.17)	5.06 (.16)	3.86 (.26)	5.11 (.31)	4.44 (.30)

Note. [a]Word count per text. [b]Determined with the Flesch Reading Ease Formula. [c]Results of pilot-testing based on ratings by an independent group of participants (N = 18); plausibility and understandability of the texts were measured by six and nine items, respectively (Plausibility scale: Cronbach's α = .77/.84; Understandability scale: Cronbach's α = .69/.86); number of arguments was assessed through an open-ended question, clarity of text stance and text interestingness were assessed by a single item each. All response categories ranged from 1 to 6, except for the number of arguments.

Table 2

Descriptive Statistics and Intercorrelations of Participant Stance and Dependent Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1 Author Status (Contrast-Coded, -1 = Native; 1 = Non-Native)	0.03	1.00	1							
2 Text Order (Contrast-Coded, -1 = Pro-Contra; 1 = Contra-Pro)	0.03	1.00	.03	1						
3 Situation-model Strength (Belief-Consistent)	2.29	0.67	-.12	.07	1					
4 Situation-model Strength (Belief-Inconsistent)	2.03	0.69	-.10	-.14	.28*	1				
5 Text-base Strength (Belief-Consistent)	2.36	0.69	-.17	-.16	.71**	.29*	1			
6 Text-base Strength (Belief-Inconsistent)	2.46	0.63	-.09	-.10	.26*	.53**	.33**	1		
7 Certainty Beliefs (z-Standardized)[a]	13.65	4.22	-.03	-.14	-.05	-.37**	-.09	-.20	1	
8 Justification by Multiple Sources (z-Standardized)[a]	22.82	4.12	-.03	-.08	-.14	.28*	-.12	.19	-.03	1

Note. $N = 62$. Situation-model strength: Probit-transformed proportion of yes-responses to inference items; Text-base strength: Probit-transformed proportions of yes responses to paraphrase items. [a]*M* and *SD* for certainty and justification-by-multiple-sources beliefs are based on raw scores. Author status and text order (nominal variables with two levels each) were contrast-coded. *$p < .05$ (two-tailed), **$p < .01$ (two-tailed).

Table 3

Mean Proportions (with Standard Errors) of Yes Responses in the Comprehension Measure for Inference, Paraphrase, and Distractor Items

Text	Author	Inference Items	Paraphrase Items	Distractor Items
Belief-Consistent.	Native Authored	.84 (.02)	.87 (.02)	.08 (.02)
	Non-Native-Authored	.84 (.02)	.85 (.02)	.12 (.02)
	Total	.84 (.02)	.86 (.01)	.10 (.02)
Belief-Inconsistent	Native Authored	.76 (.03)	.88 (.02)	.09 (.02)
	Non-Native-Authored	.74 (.03)	.87 (.02)	.11 (.02)
	Total	.75 (.02)	.88 (.02)	.10 (.02)

Note. $N = 62$

Figure 1. Situation-model strength and text-base strength across the belief-consistent and belief-inconsistent texts. Error bars represent standard error of the mean.
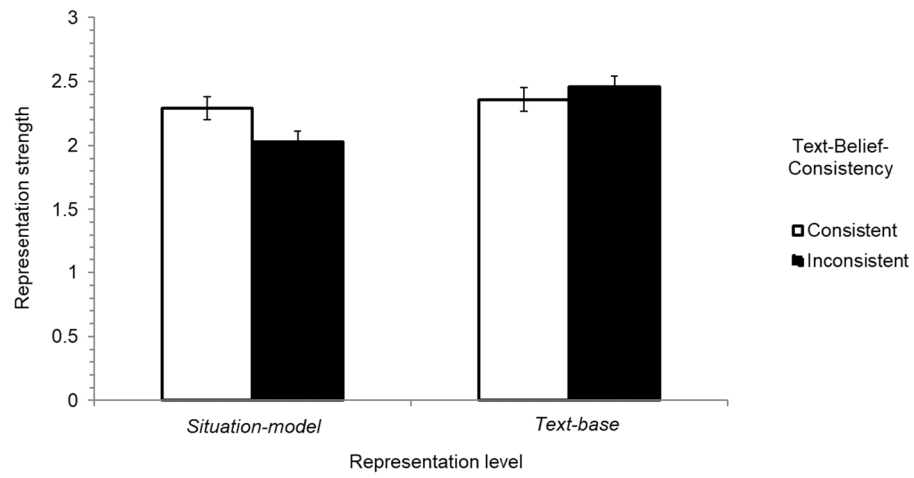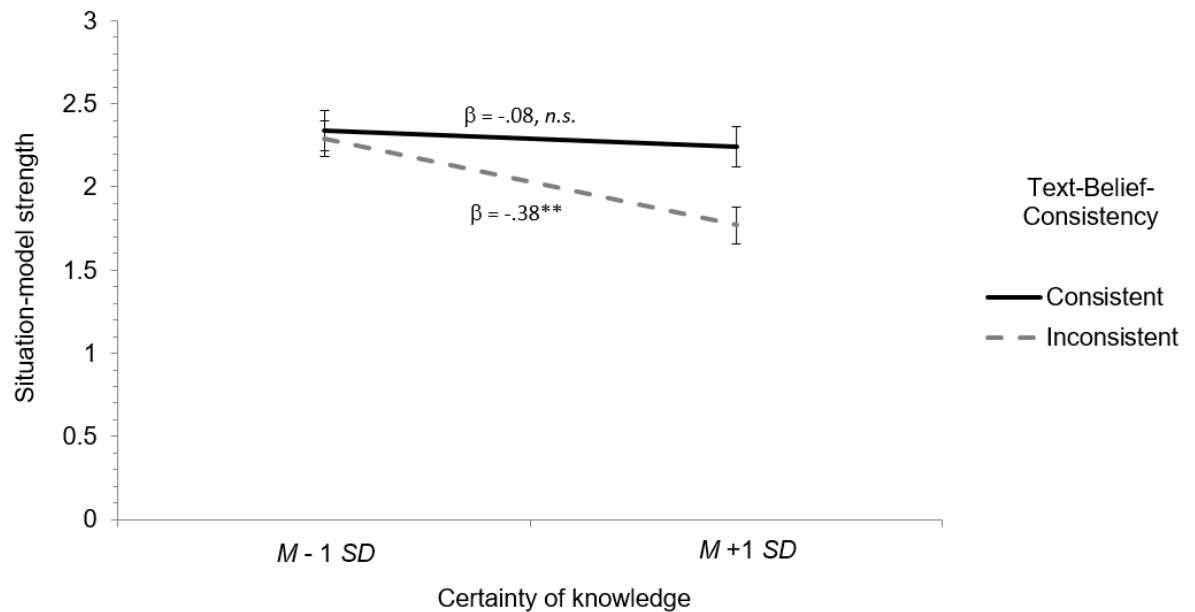
Figure 2. Simple slopes of beliefs about Certainty of knowledge (a) and Justification for knowing from multiple sources (b) with Situation-model strength as dependent variable. The error bars depict standard errors of the mean for the point estimates of the text-belief consistency effect at a high (+ 1 SD) and low (– 1 SD) level of beliefs.

a)

b)