

The Role of Epistemic Thinking in Comprehension of Multiple Online Source Perspectives

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Abstract

One of the ongoing challenges of developing learners' digital literacy is fostering the ability to critically construct meaning from diverse online sources. The purpose of the current study is to shed light on the role of learners' epistemic thinking on their ability to identify and interpret online source perspectives. The study examines the effect of epistemic perspective (absolutist, multiplist, or evaluativist) and online source perspectives (conflicting or converging blog-posts) on learners' ability to understand, evaluate, and integrate multiple socio-scientific perspectives. Preliminary results from a pilot study indicated that in the converging blog-posts condition epistemic thinking did not play a significant role, however, in the conflicting blog-posts condition, participants with high evaluativist scores were significantly more successful in comprehension and integration of multiple source perspectives. A concerning finding is that few students referred to author perspectives in their source evaluations. We propose that when presenting learners with conflicting online sources it is also important to address learners' epistemic perspectives and to help them develop a deeper understanding of the constructed nature of knowledge.

Keywords: Digital literacy, personal epistemology, Internet, online credibility, multiple source integration.

Introduction

The Challenge of Critical Knowledge Construction

Critical knowledge construction from online sources is one of the key challenges of online learning in the digital era (Dede, 2010). Web-based information may lack reliability because of the absence of professional gatekeepers (e.g., editors or reviewers) to monitor content, the blending of multiple information genres, and its openness to alteration (Flanagin & Metzger, 2007). Therefore, critical web users must master skills and strategies for evaluating online credibility and for constructing knowledge from multiple online information sources (AASL, 2007; Binkley et al., 2010; Brand-Gruwel, Wopereis, & Walraven, 2009; Author B, 2004). However, multiple studies have consistently shown that learners experience considerable difficulties in critically evaluating and integrating online sources (Brand-Gruwel & Stadtler, 2011; Bråten, Britt, Strømsø, & Rouet, 2011; Gasser, Cortesi, Malik, & Lee, 2012; Wiley et al., 2009).

Effective evaluation and integration entails paying attention to both the source and the information it presents (Brand-Gruwel et al., 2009; Metzger, 2007; Sundar, 2007). Indeed, a crucial aspect of evaluation and integration is the ability to form connections between sources and their contents, that is, the learners' need to attribute the information they are reading to a specific source and to pay attention to how source characteristics, such as identity, credentials, perspectives, motivation and credibility, impact the information created and presented by that source (Rouet, 2006; Wiley et al., 2009; Wineburg, 1991). However, multiple studies

demonstrate that learners often ignore source data as they read online and focus primarily on the medium characteristics and the content (Eastin, Yang, & Nathanson, 2006; Gasser et al., 2012).

The major factors that were found to affect users' source awareness are individuals' level of interest in the topic, prior knowledge, disciplinary expertise, and the source and message characteristics (Flanagin & Metzger, 2007; Gasser et al., 2012; Metzger, 2007; Sundar, 2007). Strømsø, Bråten and Britt (2010) propose that conflicting, contradictory, disrupted, or missing information may increase source salience. Thus readers may pay more attention to sources when they offer conflicting accounts of similar events.

The specific focus of this study is on learners' ability to identify and interpret source perspectives. The term "perspective" is used in this study to refer to the situated and distinct ways in which knowers see the world around them (Miller & Boix Mansilla, 2004). Perspectives are embedded in concepts, values, procedures and tools which are used to describe and study the world and therefore underlie source motivations and purposes (Hobbs & Frost, 2003).

The Role of Epistemic Thinking in Source Evaluation and Integration

Views of the relation between source and content may be informed learners' perception of the nature of knowledge and knowing (Hofer & Pintrich, 1997). The idea that knowledge is shaped by the points of view and perspectives of the individuals who create it, reflects an epistemic view that emphasizes the constructed nature of knowledge (Kuhn, 2001; Kuhn & Weinstock, 2002). In contrast, an epistemic view that situates the source of knowledge in an objective reality may downplay the role of individuals' perspectives in the construction of knowledge.

In the current research we adopt the developmental model of epistemological understanding proposed by Kuhn and her colleagues (Kuhn, 1991, 2001; Kuhn, Cheney, & Weinstock, 2000; Kuhn & Weinstock, 2002). Kuhn's model claims that the main cognitive task that guides the development of epistemological understanding is the challenge of coordinating the objective and the subjective dimensions of knowing. The developmental trajectory outlined in this model revolves around a shift from an *absolutist* perspective, that knowledge is objective, certain, and located in the external world, to a *multiplist* perspective according to which the source of knowledge is the individual and knowledge is therefore multiple, subjective, uncertain, and cannot be adjudicated. The growing need to choose reasonably between alternate accounts drives the further shift to an *evaluativist* perspective. The evaluativist perspective considers knowledge as constructed by people and acknowledges uncertainty without forsaking the need for evaluation (Kuhn et al., 2000; Kuhn & Weinstock, 2002). Several recent studies examined how individuals' views of knowledge and knowing may affect their ability to interpret sources and evaluate their credibility. For example, Mason and her colleagues demonstrated that students who reflect on the justification of knowledge gain more from online learning (Mason, Ariasi, & Boldrin, 2011). More recently, Barzilai and Zohar (2012) observed that evaluativist students paid more attention to the perspectives of online sources, compared to absolutist ones.

Purpose of the Current Study

The purpose of the current study is to expand our understanding of the role of learners' epistemic thinking in critical evaluation and integration of online sources, by focusing on learners' ability to identify and understand multiple online source perspectives, and to employ these perspectives in order to critically evaluate and integrate multiple online sources. An additional goal of the study is to examine whether contrasts between sources may increase learners' awareness of multiple source perspectives and thus promote critical evaluation and integration.

The specific questions of the study are:

1. What is the impact of learners' epistemic perspectives on their ability to comprehend online source perspectives and to employ these perspectives in order to critically evaluate and integrate multiple online sources?
2. Does presenting learners with conflicting online sources increase their ability to comprehend and employ online source perspectives?

In general, we hypothesized that learners with evaluativist views of knowledge will be better able to comprehend online source perspectives, and to employ these perspectives in critical evaluation and integration, than learners with absolutist views of knowledge. We also hypothesized that presenting learners with conflicting sources will increase their ability to comprehend and employ online source perspectives. However, this effect may be moderated by epistemic perspectives.

Method

Data is being collected in an experimental design which examines the effect of epistemic perspective (absolutist, multiplist, or evaluativist) and online source perspectives (conflicting or converging) on learners' ability to comprehend online source perspectives, and to employ these perspectives in order to critically evaluate and integrate multiple online sources.

Participants

The participants of the study are 180, evenly gendered, undergraduate students.

Materials

The study deals with the socio-scientific dilemma of whether Israel should develop an extensive desalination system or should it continue to rely on ground water and recycled water resources. For the purpose of the current study we designed several short blog-posts, based on authentic online sources. The blog-posts are of a similar length, style, and author expertise level. The two key differences between the blogs are the author affiliation and perspective. Blog-posts are presented to the participants in two conditions: a conflicting perspectives condition and a converging perspectives condition (see Table 1).

**Table 1. Blog-post perspectives
Conflicting Perspectives Condition**

	Pro desalination	Against desalination
Environmental considerations	Author affiliation: Consultant to the Water Authority Author perspective: Desalination will help stop groundwater pollution.	Author affiliation: Consultant to the Nature and Parks Authority Author perspective: Desalination will cause severe damage to the marine environment.
Economic considerations	Author affiliation: Consultant to the Ministry of Finance Author perspective: Desalination will help lower water prices.	Author affiliation: Consultant to the Ministry of Environmental Protection Author perspective: Changing public habits and improving water management are viable and less expensive solutions than desalination.

Converging Perspectives Condition

	Pro desalination	Pro desalination
Environmental considerations	Author affiliation: Consultant to the Water Authority Author perspective: Desalination will help stop groundwater pollution.	Author affiliation: Consultant to the National Water Company Author perspective: Desalination does not have a negative impact on the marine environment.
Economic considerations	Author affiliation: Consultant to the Ministry of Finance Author perspective: Desalination will help lower water prices.	Author affiliation: Consultant to the Ministry of Infrastructure Author perspective: Changing public habits and improving water management are insufficient solutions for supplying water needs.

Measures

Epistemic perspectives are measured before reading the blog-posts using a scenario-based epistemic thinking assessment that refers to the desalination context and assesses absolutist ($\alpha = .68$), multiplist ($\alpha = .80$), and evaluativist ($\alpha = .77$) perspectives (Barzilai & Weinstock, in preparation). Prior knowledge, topic interest, and Internet experience are controlled.

After reading the blog-posts, the participants are assigned the following tasks:

- Source perspective inference task – Participants are presented with 20 statements that did not appear in the blog-posts and are asked to decide which blogger wrote them.
- Source perspective description task – Participants are asked to explicitly describe each blogger's purpose and perspective.
- Argument construction task – Participants are asked to write an argument regarding the desalination controversy. The arguments are coded for the number of perspectives mentioned.
- Source credibility evaluation task – Participants are asked to evaluate each blog's credibility and to provide credibility justifications. These justifications are coded for mentions of source perspective, motivation, purpose, or bias.

Procedure

The participants are randomly assigned to the converging blog-posts condition or to the conflicting blog-posts condition. The blog-posts are presented to the participants in a random order. All questionnaires and tasks are completed online using survey software.

Preliminary Results

Forty three undergraduate students participated in a pilot study (6 participants had partial data due to technical difficulties). A two-way ANOVA with evaluativism (high and low) and condition (conflicting and converging blog-posts) as independent variables and the combined score of both source perspective comprehension tasks as the dependent variable, revealed a significant effect of evaluativism, $F(1,33) = 4.445$, $p = .043$, $\eta^2 = .119$, a non-significant effect of condition $F(1,33) = .470$, $p = .498$, $\eta^2 = .014$, and a significant interaction between evaluativism and condition, $F(1,33) = 4.445$, $p = .043$, $\eta^2 = .119$. Subsequent Mann-Whitney U tests indicated that in the converging condition there was no significant difference between groups, $U = 42.50$, $p = .901$, however, in the conflicting condition participants with a high evaluativist score were significantly more successful in source perspective comprehension, $U = 3.50$, $p = .002$. Means and standard deviations are provided in Table 2.

An ANOVA with argument task score as the dependent variable, revealed a non-significant effect of evaluativism, $F(1,38) = 2.203$, $p = .146$, $\eta^2 = .055$, a significant effect of condition $F(1,38) = 5.793$, $p = .021$, $\eta^2 = .132$, and a non-significant interaction between evaluativism and condition, $F(1,38) = 2.459$, $p = .125$, $\eta^2 = .061$. On the whole, participants in the conflicting condition mentioned more perspectives in the argument task than participants in the converging condition, $U = 123.50$, $p = .013$. Again, no significant impact of epistemic perspective was found in the converging condition, $U = 45.50$, $p = .901$, while in the conflicting condition participants with a high evaluativist score were significantly more successful in constructing arguments based on multiple perspectives, $U = 28.50$, $p = .037$.

Very few students referred to author perspectives, motivations, or biases in their source credibility evaluations. This is a concerning finding that deserves further examination.

Table 2. Source perspective comprehension and argument perspective scores

		Source perspective comprehension		Perspectives in argument	
		M	SD	M	SD
Converging blog-posts	Low evaluativism	11.00	5.51	1.36	1.07
	High evaluativism	11.00	5.48	1.33	1.41
Conflicting blog-posts	Low evaluativism	8.67	3.01	1.67	1.32
	High evaluativism	15.58	4.29	2.77	.93

Discussion

The findings of this study support the claim that views regarding the nature of knowledge and knowing play a prominent role in the comprehension and integration of multiple online sources (Bråten et al., 2011). Specifically, the unique contribution of this study is in suggesting that one of the reasons evaluativists may be more successful in comprehending and integrating multiple online sources is because they pay more attention to differences between source perspectives. Evaluativists view knowledge as constructed by the knowers and thus may be more aware of the role and impact of author perspectives. This awareness may lead them to be more attentive to differences between source perspectives as they read online sources. However, the learning context also plays important role in learners' epistemic thinking: Contrasts between sources increased comprehension and integration of source perspectives, but only among evaluativist learners.

Although evaluativists were aware of the differences between source perspectives they rarely referred to these differences in their source credibility evaluations. This finding may indicate a low understanding of source credibility, but it may also be a result of the study conditions: Perhaps because the participants were presented with the sources in the context of a study that took place in a higher education institution they may have assumed that the sources are trustworthy.

The educational implications of this study are that the efficacy of using the Internet as a tool for engaging learners in authentic controversial issues may be contingent upon learners' epistemic perspectives. When conflicting online information sources are introduced it is important to address learners' underlying epistemologies and to provide scaffolds that will help all learners

pay more attention to the constructed nature of knowledge, and develop increasingly evaluativist views of knowledge and knowing.

References

- AASL. (2007). Standards for the 21st-century learner: American Association of School Libraries.
- Barzilai, S., & Weinstock, M. (in preparation). Development and validation of a scenario-based measure of epistemic thinking.
- Barzilai, S., & Zohar, A. (2012). Epistemic thinking in action: Evaluating and integrating online sources. *Cognition and Instruction, 30*(1), 39-85.
- Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., & Rumble, M. (2010). White Paper: Defining 21st century skills *ATCS (Assesment & Teaching of 21st Century Skills) Framework for 21st Century Learning*.
- Brand-Gruwel, S., & Stadtler, M. (2011). Solving information-based problems: Evaluating sources and information. *Learning and Instruction, 21*(2), 175-179.
- Brand-Gruwel, S., Wopereis, I., & Walraven, A. (2009). A descriptive model of information problem solving while using internet. *Computers & Education, 53*(4), 1207-1217.
- Bråten, I., Britt, M. A., Strømsø, H. I., & Rouet, J.-F. (2011). The role of epistemic beliefs in the comprehension of multiple expository texts: Toward an integrated model. *Educational Psychologist, 46*(1), 48-70.
- Dede, C. (2010). Comparing frameworks for 21st century skills. In J. Bellanca & R. Brandt (Eds.), *21st century skills: Rethinking how students learn* (pp. 51-75). Bloomington, IN: Solution Tree Press.
- Eastin, M. S., Yang, M.-S., & Nathanson, A. I. (2006). Children of the Net: An empirical exploration into the evaluation of internet content. *Journal of Broadcasting & Electronic Media, 50*(2), 211-230.
- Flanagin, A. J., & Metzger, M. J. (2007). The role of site features, user attributes, and information verification behaviors on the perceived credibility of web-based information. *New Media & Society, 9*(2), 319-342.
- Gasser, U., Cortesi, S., Malik, M., & Lee, A. (2012). Youth and digital media: From credibility to information quality: Berkman Center for Internet & Society.
- Hobbs, R., & Frost, R. (2003). Measuring the acquisition of media-literacy skills. *Reading Research Quarterly, 38*(3), 330-355.
- Hofer, B. K., & Pintrich, P. R. (1997). The development of epistemological theories: Beliefs about knowledge and knowing and their relation to learning. *Review of Educational Research, 67*(1), 88-140.
- Kuhn, D. (1991). *The skills of argument*. New York, NY: Cambridge University Press.
- Kuhn, D. (2001). How do people know? *Psychological Science, 12*(1), 1-8.
- Kuhn, D., Cheney, R., & Weinstock, M. (2000). The development of epistemological understanding. *Cognitive Development, 15*(3), 309-328.
- Kuhn, D., & Weinstock, M. (2002). What is epistemological thinking and why does it matter? In B. K. Hofer & P. R. Pintrich (Eds.), *Personal epistemology: The psychology of beliefs about knowledge and knowing*. (pp. 121-144). Mahwah, NJ: Lawrence Erlbaum Associates.
- Mason, L., Ariasi, N., & Boldrin, A. (2011). Epistemic beliefs in action: Spontaneous reflections about knowledge and knowing during online information searching and their influence on learning. *Learning and Instruction, 21*(1), 137-151.

- Metzger, M. J. (2007). Making sense of credibility on the Web: Models for evaluating online information and recommendations for future research. *Journal of the American Society for Information Science and Technology*, 58(13), 2078-2091.
- Miller, M., & Boix Mansilla, V. (2004). Thinking across perspectives and disciplines *Interdisciplinary Studies Project, Project Zero*. Cambridge, MA: Harvard Graduate School of Education.
- Rouet, J.-F. (2006). *The skills of document use: From text comprehension to web-based learning*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Strømsø, H. I., Bråten, I., & Britt, M. A. (2010). Reading multiple texts about climate change: The relationship between memory for sources and text comprehension. *Learning and Instruction*, 20(3), 192-204.
- Sundar, S. S. (2007). The MAIN model: A heuristic approach to understanding technology effects on credibility. In M. J. Metzger & A. J. Flanagin (Eds.), *Digital Media, Youth, and Credibility* (pp. 73-100). Cambridge, MA: MIT Press.
- Wiley, J., Goldman, S. R., Graesser, A. C., Sanchez, C. A., Ash, I. K., & Hemmerich, J. A. (2009). Source evaluation, comprehension, and learning in Internet science inquiry tasks. *American Educational Research Journal*, 46(4), 1060-1106.
- Wineburg, S. S. (1991). Historical problem solving: A study of the cognitive processes used in the evaluation of documentary and pictorial evidence. *Journal of Educational Psychology*, 83(1), 73-87.