Incorporating Task and Context into the Framing of Personal Epistemologies’ Portraits

Liliana Maggioni, Emily Fox, & Patricia A. Alexander

University of Maryland
Abstract

This study reports the development and testing of a context-specific measure of epistemic beliefs related to text-based inquiry, the 41-item Beliefs About Inquiry Questionnaire (BAIQ). Undergraduates (n=240) completed the BAIQ twice, first thinking about inquiry tasks related to school and second thinking about tasks related to their personal purposes. Both the school and personal scales had high reliability ($\alpha = .85$). Mean scores in the two contexts were highly correlated ($r = .78$), although students tended to have better mean scores for school, while certain items appeared problematic for the personal context. Overall epistemic competence was not high. We suggest that schooling can contribute to the development of epistemic competence, but there is still much space for fostering epistemic growth in school.
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Who is going to teach the introductory physics course next fall? Is it going to rain on Sunday? What is the best way to get to John’s house? What is the recipe for Grandma’s apple pie? What is a number? What is the best way to produce cleaner energy? What is Bandura’s theory of self-efficacy? Is the character of Hamlet based on a real historical figure? How individuals address these questions and how they evaluate their answers will depend on multiple types of factors.

One type of factor that comes into play with regard to how individuals respond to questions and evaluate their answers is their conceptualization of the problem being posed. Is the best way to reach John’s house the shortest route or the quickest? In the latter case, the problem becomes more complex and a quick Google map search may not provide the “best” answer. What constitutes a “number” may be seen as a fairly simple, declarative question by the child who is learning to count but presented a very complex one to Peano, Russell, Whitehead, and Gödel when they pondered the foundations of mathematics (Gödel, 1962; Peano, 1973; Whitehead & Russell, 1925-1927).

Another type of factor relates to the nature of the object of knowledge being sought, which can be very specific (as in the case of Grandma’s recipe) or very complex (ways of producing cleaner energy), for example. Finally, the purposes that individuals have in addressing the question and the relevance that the outcome will have for them very likely influence their approach to question-answering or problem solution, as well as influencing their judgments about the outcome of their response or solution efforts. The meteorologist preparing the Sunday forecast will probably tackle the question about the weather differently from John, who is planning on spending the day watching TV, or Mary, who is organizing an outdoor party
with her friends. The student working on an argumentative essay for a take-home test and the student trying to settle a bet with a friend will be likely to differ in how they approach getting an answer to the question of Hamlet's historical basis. What each of these inquirers considers to be an acceptable level of certainty in the answer obtained is likely also to differ.

Traditionally, epistemologists have concerned themselves with ideas regarding the nature and the warrants for knowledge. From a psychological standpoint, individuals’ beliefs about such issues have been related to how they conceptualize the problem at hand (or the problem space; Alexander, 2006). For example, do they believe that the best way to go from one point to another is always the shortest? Or, are there additional attributes incorporated in their definition of “best way”? Are these attributes perceived as stable, or as variable and dependent on the circumstances?

Besides beliefs about the nature of the knowledge sought, additional factors appear influential in whether the beliefs, attitudes, and behaviors that individuals adopt in the process of building knowledge are more or less adaptive. For example, the interest that individuals have and the goals that they set for themselves in a specific situation have relevance for the adaptiveness of their approach to knowledge building. A passive acknowledgment of the Sunday forecast may be adequate to fulfill John’s need to know about the coming weather and make him sure that nothing major is going to disrupt his quiet indoor week-end. Conversely, Mary will probably consult various forecasts before stocking her fridge for the Sunday party, and the meteorologist will consider a multitude of factors, models, and prior knowledge to decide what meteorological conditions have the best probability of developing.

Similarly, the characteristics of the object of knowledge influence what beliefs, attitudes, and behaviors will prove adaptive for the process of building knowledge about that object. For
instance, one will probably need to go through few, simple steps to develop a satisfactory understanding of Grandma’s recipe, while building knowledge about the issue of cleaner energy production will require the consideration and evaluation of multiple factors, interrelations, and necessary trade-offs, besides the understanding of the principles and processes regarding the production of different kinds of energy and their short-term and long-term impact on the environment.

Do these other factors (e.g., goals of the knowledge building process and degree of complexity of the object of knowledge) influence individuals’ conceptualization of the nature of knowledge and its warrants, and thus the epistemic beliefs to which they would subscribe in a particular instance? Are epistemic stances relatively stable across domains, or at least within specific domains (Buehl, Alexander, & Murphy, 2002), or should we redefine this construct and thus assess it in contextual terms, as some theoretical frameworks seem to suggest (Elby & Hammer, 2010)? In other words, if we know that John found a satisfactory answer to his question about the weather by simply watching the weather forecast on the television, should we expect that he would similarly believe that knowledge about cleaner energy sources could be easily developed by listening to a brief statement from a scientist in a televised interview? If so, would John’s approaches to the situations equally manifest epistemic naïveté?

Developmental studies (e.g., King & Kitchener, 2002; Kuhn & Weinstock, 2002; Perry, 1970) and domain-specific studies (e.g., Louca, Elby, Hammer, & Kagey, 2004; Maggioni, 2010) have reported that even within the same interview (or classroom exchange) individuals can voice beliefs that appear indicative of different developmental levels or different epistemic stances. The contexts that are instantiated for the individuals or that individuals call to mind seem to play a role in what beliefs get activated, suggesting that epistemic beliefs may be
responsive to the specific situation at hand. Thus, a history student may assert that historical knowledge is found, when thinking about archeological discoveries, while the same student may also say that historical knowledge is hopelessly subjective, when thinking about the different perspectives and personal interests of eyewitnesses. Regrettably, the typical approach to the assessment of epistemic beliefs can shed little light on this important issue (Buehl, 2008; Wood & Kardash, 2002). In the literature, with few exceptions, the object of knowledge investigated or the purpose of the investigation has not played a major role in the assessment of epistemic beliefs, which have been assumed to have an overall general character. Could it be that the little variance usually captured by extant measures depends, in part, on overlooking important components such as contextual or personal influences? The reliability of the factors identified by the scales also tends to remain low. In other words, the portrait of individuals’ epistemic stances offered by extant measures is probably lacking important features and is overall blurry.

In this study, we did not assume that the same set of epistemic beliefs can serve individuals equally well in their process of knowledge building in different contexts. For this reason, we use the word “adaptive” to refer to the set of those beliefs and approaches to the process of knowing that have the potential to successfully fulfill the knowledge need in the specific situation, by being contextually responsive. Thus, we view epistemic competence as the capacity of individuals to approach the process of knowledge building with a set of beliefs, attitudes, and behaviors adaptive for the specific situation, or, in other words, a set of beliefs, attitudes, and behaviors that facilitate an appropriate representation of the problem-space. More specifically, in this study we attempted to examine these contextual and personal influences by focusing on the epistemic beliefs that individuals entertain in regard to a specific task, carried out in a specific context. In other words, we tried to incorporate in our measure of epistemic beliefs
a range of factors that may affect how individuals conceptualize the nature of the knowledge sought under specific circumstances, and what justifications they deem appropriate given the nature and the relevance of the question they are seeking to address. In particular, we aimed to attend to relevant differences that might emerge in individuals' approach to knowledge building across the different text environments encountered online and in print. Using that measure, we attempted to explore college students’ epistemic beliefs about text-based inquiry conducted within the academic context or in the pursuit of personal interests.

For this purpose, we developed a context-specific measure of epistemic beliefs related to text-based inquiry. We began by focusing on epistemic beliefs we expected to be especially relevant when knowledge building takes place through text-based inquiry, with particular attention to aspects that might differ in print versus Web environments. We consulted a multidisciplinary body of literature including educational psychology (Bråten, 2009; Hofer, 2004; Murphy, Long, Holleran, & Esterly, 2003), philosophy of education (Lankshear, Peters, & Knobel, 2000), library science (Swanson, 2006), information science (Frohmann, 2008), and educational technology (Bråten, Strømsø, & Samuelstuen, 2005; Tsai, 2004) in order to identify these central beliefs about knowledge and knowing.

From this multidisciplinary literature, we identified four broad potential categories for such epistemic beliefs; specifically, those relating to the nature of the processing involved, those related to the sub-activity undertaken, those related to the nature of the content, and those related to social construction of shared knowledge. With regard to the nature of the processing, we included items related to context-specificity, and to speed and effort of evaluating, finding, remembering, and using content related to an inquiry task. With regard to the sub-activity, we included items related to acquisition, location, storage, use, and evaluation of content. Items
regarding the nature of the content addressed stability, size, and complexity, while those related to communal aspects of shared knowledge addressed issues of ethics and authority. In this way, we attempted to weave together multiple strands to create what we hoped would be an instrument that could produce complex, nuanced, and informative epistemic portraits of personal epistemologies related to text-based inquiry. By basing the construction of the questionnaire’s items on extant literature and empirical evidence, we tried to address the variety of areas that seem to be within the domain of the construct under study, and thus increase the content validity of the instrument (Cherulnik, 2001). We further attempted to contextualize individuals’ beliefs by asking participants to respond to the same set of items while thinking about an inquiry task they would perform for school-related purposes (school context) or for personal purposes (personal context). For additional validation, we asked participants to describe the specific inquiry activity they had in mind as they responded.

In constructing and scaling the items, we followed Kuhn’s model of epistemic development (Kuhn, Cheney, & Weinstock, 2000; Kuhn & Weinstock, 2002), hypothesizing that epistemic stances can be ordered along a continuum according to the degree of successful integration of the subjective and objective aspects of knowing. We acknowledge that an evaluativist approach to knowledge building is not necessarily the only one that is adaptive for certain objects of inquiry (e.g., finding the shortest route between two places) or purposes of inquiry. However, we do assume that in the particular case of text-based inquiry, epistemically competent individuals would be likely to view the process of knowledge building as the result of the interaction between an active, critical reader and the texts—texts that have specific authors, characteristics, and content. Conversely, less epistemically competent individuals would likely fail to see such interaction, either perceiving the role of the knower as eminently passive (i.e., a
receiver of information) or missing the realization that texts are produced by authors, who use the content and the characteristics of the texts to communicate their thoughts. Moreover, in order to test whether context and specific task relate to individual epistemic portraits, we needed to order the beliefs, attitudes, and behaviors that may compose such portraits according to the same criterion.

In summary, we attempted to develop and test a context-specific and task-specific measure of epistemic beliefs related to text-based inquiry. Specifically, in relation to text-based inquiry, this study explores the following questions.

1. Do students manifest consistent epistemic stances within and across contexts (school and personal)?
2. What degree of epistemic competence do students manifest within each context?
3. What attitudes, behaviors, and ideas emerge as potentially adaptive and as potentially problematic?
4. Do these adaptive or problematic attitudes, behaviors, and ideas differ across contexts?

Methods

Participants

This study is part of a larger research project using an online methodology to investigate undergraduates' beliefs, behaviors, and attitudes related to knowledge, information, and truth (Alexander, 2009; Winters, Grossnickle, Loughlin, & Alexander, 2010). Participants for this study were 240 undergraduate students (196 females), who were taking assorted courses in learning and development at a large mid-Atlantic state University. Although the participants were pursuing a variety of majors, their main concentration was in the social sciences (e.g.,
psychology, criminal justice, community health, and education). Their ethnicity was also varied (Non-Hispanic White 62%, Asian 16%, Black 13%, Hispanic, 4%, Other 5%), and their mean age was 21 years ($SD = 2.33$). On average, they had completed 77 cumulative college credits ($SD = 23.82$) and their average self-reported GPA was 3.17 ($SD = .49$). They received extra credit in the course for their participation.

**Measure**

To gather data on the context-specific and task-specific nature of epistemic beliefs, we asked students to complete the Beliefs About Inquiry Questionnaire, a 41-item, 100-millimeter scale survey (Table 1). The 41 items on the questionnaire were selected based on a pilot study with a similar sample of undergraduates, who responded to a longer version with a pool of 128 items. Items were selected from that pool so as to maximize the reliability of the scale while still ensuring representation of the theoretically-derived categories described above. In other words, we attempted to increase the reliability of the scale without sacrificing its content validity. In the final version, 18 items were worded in such a way that strong agreement with the statement implied attitudes, behaviors, or ideas suggesting evaluativist beliefs and a successful integration of the subjective and objective aspects of knowledge (e.g., “Before I use content from a particular source, I consider the trustworthiness of the source.”). In the case of the remaining 23 items, the same beliefs were suggested by a strong disagreement with the statements (e.g., “Long explanations are less useful to me than just the facts.”).

**Procedure**

The questionnaire was presented online, and participants completed it at a time and location of their choosing. The first two items participants saw were practice items (taken from the set of those excluded from the final version) intended to familiarize them with the format and
procedure for responding; responses to these practice items were not included in the data analyses reported. Students completed the questionnaire twice. The first time they were asked to think about what they did and thought when engaging in inquiry tasks related to school (Beliefs About Inquiry Questionnaire - School, BAIQ-S), and the second time to think about engaging in inquiry tasks for their own personal purposes (Beliefs About Inquiry Questionnaire - Personal, BAIQ-P). Immediately prior to responding to this questionnaire, students (as part of the larger study) had completed a school-related inquiry task using multiple sources. For that reason, we thought it appropriate to position the contextualization of the BAIQ to school-related inquiry tasks first, as students would have just been primed for that context.

The items on the questionnaires were identical and they were presented in the same order. Participants were asked to indicate how much they agreed or disagreed with the given statement by positioning a slash mark on the 100-millimeter line provided, which had the endpoints "Strongly Disagree" (at the left end) and "Strongly Agree" (at the right end). They saw only one item at a time. Responses were scored according to the position of their mark, with a mark all the way to the left of the scale registering as "1" and a mark all the way to the right of the scale registering as "100." After responding to all of the items, students were asked to briefly describe what specific type(s) of text-based inquiry or task related to the given context they had in mind as they responded to the questionnaire. Figure 1 shows a shot of the computer screen introducing the questionnaire to participants and providing directions for its completion.

**Results and Discussion**

Using the research questions as our organizational framework, we report here the analyses and the results of the study and discuss their implications for the issues investigated.
Question 1: Consistency of Students’ Epistemic Beliefs Within Each Context (School and Personal) and Across Contexts

Our questionnaire included items covering a variety of aspects that we expected to come together to create portraits of students’ personal epistemologies in relation to text-based inquiry. How well did these items and aspects hang together? We tested the consistency of what our questionnaire targeted as related to students’ epistemic beliefs within each context (i.e., school or personal) by calculating the reliabilities of the two scales. We reverse-coded 18 items, so that low scores corresponded to beliefs and behaviors suggesting a more successful integration of the objective and subjective aspects of knowledge and thus epistemic competence for the specific task of text-based inquiry. With this reverse-coding, Cronbach’s alphas were .85 for both the BAIQ-S and BAIQ-P scales, suggesting that students tended to be consistent in their beliefs as reflected in our set of items.

According to the theoretical framework used for developing the items of the questionnaire, epistemic portraits would result from pulling together a number of different facets of epistemic attitudes, beliefs, and behaviors. Thus, we argue that the content validity of the BAIQ is based on its very capacity to capture (or not) the multiplicity of features composing such portraits. The high Cronbach’s alphas assured us that the correlation between the scores resulting from the administration of the BAIQ and the true scores was high and specifically equal to .92, given that Cronbach’s alpha is “essentially equal to the square of that correlation” (Cronbach & Shavelson, 2004, p. 400). The error of measurement was therefore quite small and the consistency of the measure rather high. In other words, we concluded that the epistemic portraits offered by the BAIQ hold together reasonably well. For this reason, we did not feel compelled to submit the data to factor analysis in order to support the content validity of the
measure. In addition, in this study we were interested in capturing an epistemic portrait that would be as nuanced as possible rather than in identifying what features in the portrait should be considered prominent.

On the other hand, we decided to further explore the issue of epistemic consistency across contexts by analyzing more closely the beliefs and attitudes expressed by the students through the two questionnaires. Specifically, we calculated and compared average scores on each parallel item of the BAIQ-S and BAIQ-P. Consistency across context would be signaled by scores that are both lower than or both higher than the mid-point of the scale on pairs of items. The rationale for this kind of comparison lies in the way the items were constructed and especially relies on the hypothesis that epistemic stances can be ordered along a continuum according to the degree of successful integration of the subjective and objective aspects of knowing. The mid-point of the scale signals, on the continuum, a change between agreement and disagreement with the statements, and thus a shift between viewing the process of knowledge building as requiring an interaction between an active critical reader and authored texts and viewing knowledge as resulting from simply plucking information from an authorless text.

By calculating and comparing average scores on each parallel item of the BAIQ-S and BAIQ-P, we identified three sets of items: items with average scores less than the midpoint on both surveys (i.e., beliefs and attitudes compatible with epistemic competence); items with average scores higher than the midpoint on both surveys (i.e., beliefs and attitudes hindering epistemic competence); and items with average scores below the midpoint for one context and higher than the midpoint for the other (i.e., items suggesting different beliefs and attitudes across contexts). In regard to this third set of items, we noticed that no item had an average score
higher than the midpoint on the BAIQ-S and below the midpoint on the BAIQ-P. Table 2 reports the average scores for the items for each context, ordered according to the theoretical framework.

The pattern of scores suggests some degree of epistemic inconsistency, both within each context and across contexts. At the same time, we believe that the analysis of these patterns also sheds some light on the rationale that appears to guide students’ thinking and shapes their beliefs, attitudes, and behaviors in respect to text-based inquiry tasks. For example, students tended to highlight the evaluative component of the inquiry activity and acknowledged their responsibility in regard to this process (e.g., “I usually evaluate the accuracy of the facts presented in what I read”), enjoyed investigating questions that require consideration of multiple aspects and the availability of multiple sources (e.g., “I like being able to access a lot of material on any topic”), and found it overall easy to carry out the inquiry process, especially when dealing with familiar or interesting topics (an instance that per se might signal expertise).

At the same time, respondents tended to agree with items suggesting that the inquirer plays a minor role in the process of knowledge building (e.g., “Getting answers is just a matter of accessing the right sources”), disliked dealing with nuances and explanations (e.g., “I do not like answers that begin with ‘it depends’”), expressed a preference for reaching a quick and definitive closure (e.g., “I prefer a straight ‘yes’ or ‘no’ answer to a question”) and for minimizing the effort expended in the inquiry process (e.g., by dismissing sources that are difficult to locate, hard to read, or that do not immediately answer the question.)

Considered together, these attitudes, behaviors, and ideas suggest a complex epistemic portrait, but one that is probably not completely unfamiliar to many educators. Students seemed to have learned the “technique” of evaluating specific sources and felt competent in doing so. Yet, they still clung to the idea that knowledge is mainly factual and ultimately resides in the
sources, while expressing their unwillingness to pursue the inquiry process, should it require too much effort. This portrait emerged similarly in the school and in the personal context, although students tended to rely more on experts (compared to common sense) and were willing to spend more time and effort on their inquiry tasks within the academic context. We will revisit these results in relation to questions 3 and 4, and discuss the sets of attitudes, behaviors, and ideas emerging from this study that may foster or hinder epistemic competence in text-based inquiry tasks.

As suggested by the comparison of scores on parallel sets of items of the BAIQ-S and BAIQ-P, the differences in student epistemic portraits across contexts were moderate. We further tested this finding by calculating the correlation between students’ mean scores in the two contexts. The Pearson correlation was high (≈ .77) and statistically significant ($p < 0.01$), confirming that individual epistemic stances tended to remain similar across inquiry tasks carried out in different contexts. The high correlation across contexts may be interpreted as supporting the hypothesis that individual epistemic stances include a general component, an “epistemic attitude” that tends to characterize how individuals approach the task of knowledge building across different situations. Yet, the strength of the correlation may also be explained by the instance that both the BAIQ-S and the BAIQ-P assessed students’ epistemic beliefs in relation to a very specific kind of knowledge building task (text-based inquiry).

How similar were the tasks that students reported having kept in mind while responding to the surveys? Analysis of the specific text-based inquiry tasks cited by the students indicated that each context tended to evoke a specific set of inquiry activities in their minds. Specifically, in the case of inquiry activities carried out in school, students mainly referred to research papers, individual and group projects, and homework assignments. In regard to research carried out for
personal purposes, the inquiry tasks tended to reflect mainly the search for factual, discrete information, such as sports, music, gossip, entertainment, travel, jobs, recipes, how to perform specific tasks, and upcoming events.

A few students also referred to health-related questions and to forming personal opinions on topics of interest, particularly with regard to pursuit of answers or information to support debates or arguments with friends. This latter kind of inquiry task was usually listed together with other types of factual, discrete searches. For instance, a participant wrote: “I had several things in mind for this set of question. I jumped around from looking up general health-related information to reading about food or other social issues that I am interested in.” Another participant listed: “Cooking, gift ideas, information on health.”

We inspected the data to find any indication of association between the specification of these more open-ended inquiry tasks and students’ scores on the BAIQ-P, but we did not find any. That is to say, students who referred to these more open-ended inquiry tasks did not show any consistent trend in their score on the BAIQ-P. This finding suggests that this range of types of specific objects of inquiry did not substantially alter the overall epistemic attitude with which students would approach these somewhat different text-based inquiry tasks.

**Question 2: Degree of Students’ Epistemic Competence**

With this second question, we take a step back and consider the degree of epistemic competence emerging from these portraits. Although we do not assume that the same set of epistemic beliefs can serve individuals equally well in their process of knowledge building in different contexts, we do believe that, with reference to text-based inquiry, a view of knowledge as resulting from the interaction between an active reader and texts (with their specific authors, characteristics, and contents) generally takes into better consideration the range of factors
involved in the process of knowledge building. At the same time, within this general framework, we would expect that epistemologically competent individuals may adapt their attitudes and behaviors to the specific task at hand.

Overall, did our participants conceptualize the process of building knowledge through text-based inquiry more as interplay between multiple voices—the inquirer and the authors of the texts—or more as a quick grabbing of snippets of authorless information? Did they adapt their conceptualization to the specific task they envisioned for themselves while completing the questionnaire? We addressed this question by calculating mean scores for the BAIQ-S and the BAIQ-P scales, for each student. The means for the entire sample were 43.57 ($SD = 8.82$) and 46.61 ($SD = 9.20$) for the BAIQ-S and BAIQ-P, respectively. The difference between the two means was statistically significant ($p < 0.01$), indicating that students reliably tended to agree more with items referring to attitudes, behaviors, and ideas signaling epistemic competence in inquiry tasks performed within the school context than outside of it.

Considering that the nature of the specific inquiry that students reported having in mind while responding to the BAIQ-P was essentially factual, mainly regarding discrete information, the difference between the mean scores on the two scales suggests at least two, not necessarily incompatible, interpretations. On one hand, it is possible that students conceptualized differently (and with good reason, in our view) the epistemic space of these different kinds of inquiry tasks and thus “opted” for different epistemic stances to match the epistemic requirement of the task, showing some degree of epistemic competence. On the other hand, these results are consistent with the view that individual epistemic stances are characterized by both general (thus the higher correlations across the scales) and context-specific beliefs (thus the difference between average scale scores).
It is thus possible that the development of epistemic competence requires involvement with the kind of more open-ended, complex tasks that students seem to pursue in school, but not for personal interest, a hypothesis compatible with the results of prior studies repeatedly suggesting significant correlations between epistemic development and schooling (e.g., Perry, 1970). Yet, comparisons of average scores on parallel items showed that the main differences between the two contexts were limited to granting less truth value to common opinions, relying more on experts and on sources other than the Internet, and a willingness to expend more effort (e.g., by taking multiple steps or consulting multiple sources) and memory in the inquiry task when engaged in for school-related purposes. The nature of these differences indicates that the main features of the portraits emerging in the two contexts are quite similar, with differences regarding less salient traits, and thus suggesting overall a relatively low epistemic competence.

These results also indicate that, although students tended to be consistent in their beliefs about text-based inquiry tasks, a majority of them agreed with attitudes, ideas, or behaviors that did not suggest a high degree of epistemic competence in regard to text-based inquiry tasks; that is, not a view of knowledge characterized by the high degree of interplay between an active, critical reader and authored texts expected of epistemic competence. Specifically, for the BAIQ-S and BAIQ-P, respectively, only 32% and 24% of the students’ average scores were below 40, signaling a moderate degree of epistemic competence; 65% and 71% of the students had a score between 40 and 60, and 3% and 5% of the students had a score higher than 60. Figure 2 illustrates the frequency distributions in the two contexts.

**Questions 3 and 4: Ideas, Attitudes, and Behaviors that Emerged As Potentially Fostering or Hindering Knowledge Building Through Inquiry Tasks**
Analyses of the sets of items reported in Table 2 show that, in gathering facts to make up their own minds, students were aware that location of the information (in print versus online) and author’s purpose can influence the accuracy and trustworthiness of a source, and found it reasonable to put some effort into the evaluation process. They also considered it their personal responsibility to evaluate the accuracy of the evidence provided. In general, students found it relatively easy to determine the accuracy and usefulness of what they read, and indicated that their processing of the texts was influenced by their degree of familiarity with and interest in the topic. However, students’ reported competence in evaluating sources was challenged by students’ agreement with items stating that the most recent sources are the best sources and that the best authorities on an event are those directly witnessing it. In other words, students may see themselves as critical readers, yet their epistemic criteria are not especially powerful.

Students also expressed an overall open attitude toward what they read, enjoying encountering new ideas and stating that they often got more out of their reading than what they were originally expecting to learn. They also enjoyed the availability of extensive material and the consideration of complex questions. At the same time, it seemed that their inquiry was guided by the need to find “the” answer. Thus, they did not like conditional answers, and, while they appreciated facts, they did not find explanations especially useful. Considered together, these results suggest that while students may cherish the idea of complexity, they are not ready to deal with its epistemic implications (i.e., a less simple, non-dichotomous view of knowledge) nor with the effort that dealing with such complexity probably requires (e.g., longer search processes or consideration of sources that are harder to read). The lack of powerful criteria to address complexity may also add to students’ reluctance to embrace a more active and responsible role in the process of knowledge building.
In addition, students reported an inclination to follow the opinion of the majority (versus experts), to rely heavily on what could be quickly found online, and not to bother to remember what they read when dealing with inquiry task in the personal context. Is their disagreement with these attitudes and behaviors for school-related tasks a sign of a higher epistemic competence in the academic context, or have students just learned to comply with the technical requirements of schoolwork (e.g., referring to authoritative sources or memorizing for an exam)? Considering the overall epistemic portrait emerging from the study, we believe that we cannot discount the latter explanation.

Finally, we noted that 17 out of the 22 items with average scores below than the midpoint in both contexts were reverse coded (i.e., stating a behavior, attitude, or idea signaling epistemic competence). In other words, students tended to agree more easily with items describing an epistemically competent belief (e.g., “Before I use content from a particular source, I consider the trustworthiness of the source”) than to disagree with items describing a less competent epistemic belief (e.g., “Getting answers is just a matter of accessing the right sources”). Given that only 1 of the items identifying potentially problematic beliefs was reverse coded, we cannot discount the possibility that these results might be, at least in part, an artifact of the measurements. However, the presence of a reverse-coded item among those problematic for both contexts, and of non-reverse-coded items among those with scores below the midpoint means that it is not simply an issue of response bias. Participants were using both ends of the scale. Further, it is also not an issue of negative wording, as inspection of the items reveals.

The literature suggests at least one plausible alternative explanation. Specifically, prior studies have indicated that, when asked to choose among possible alternative solutions to an ill-structured problem, individuals do sometimes pick an option that corresponds to high levels of
epistemic development for reasons that cannot be deemed indicative of their personal level of epistemic development (Wood, Kitchener, & Jensen, 2002). In the case of this study, it is thus possible that students tended to prefer competent epistemic attitudes when described by the items, but found it more difficult to discriminate the less competent epistemic attitudes when these were directly presented.

Conclusions and Implications

We believe that this study contributes to extant literature in three main respects. From a theoretical standpoint, the study assessed student epistemic stances by gauging a broad range of attitudes, behaviors, and ideas. As a consequence, the epistemic portraits that emerged were more nuanced and offered a better understanding of students’ epistemic stances than what has been offered by other instruments in the extant literature. While the high correlation between the scores on the two measures supports the hypothesis that epistemic stances have a general component (at least in relation to similar tasks), the study also suggests that contextual factors play a role in the specific epistemic beliefs that do or do not get activated in the specific circumstance.

From a methodological point of view, by focusing on a specific task (text-based inquiry) in a specific context (school and personal) and including a broad range of attitudes, ideas, and behaviors, the questionnaires used in this study were able to assess individuals’ epistemic stances with a satisfactory degree of content validity and reliability. This encouraging result suggests a viable avenue for future research to assess this key, yet hard to detect construct. We believe that this approach may be especially useful in studies addressing the correlation (or potential influence) of epistemic beliefs with individual performance on specific tasks, a kind of question
that can be especially important in studying the influence of epistemic beliefs in academic settings.

In terms of educational implications, we believe that the results of the study indicate that schooling may contribute to the development of epistemic competence, especially if students are engaged in the kind of inquiry tasks that participants had in mind while responding to the survey. At the same time, there is still much space for fostering epistemic growth in school: after all, there were students who still operated under the assumption that there is always one right answer to most queries, an answer that should be found easily and quickly. They also voiced evaluative criteria that can seriously impede student capacity to interpret and gauge the evidence at their disposal. In addition, epistemic beliefs and evaluative criteria developed in the school context do not seem to necessarily transfer to daily tasks. With this consideration in mind, we found it particularly worrisome that a few students clumped inquiries about daily news and development of personal opinions with queries about factual, discrete pieces of information. Finally, a better understanding of the beliefs, attitudes, and behaviors that students tend to adopt in the specific processes of knowledge building may be especially useful for helping teachers foster adaptive epistemic stances and address potentially hindering ones.

Future avenues of research include working at a generalization of these results, by extending the study to a larger sample of students living and studying in different countries, and thus experiencing potentially different cultural and school contexts. We are also planning to further test the validity of the instrument, by studying the correlation of the epistemic beliefs assessed in this study with students’ performance on a school-related inquiry task and with students’ rationalization of their beliefs about knowledge, truth, and information.
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Table 1  
_Beliefs About Inquiry Questionnaire: Items Organized by Inquiry Aspect Addressed_

<table>
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<tr>
<th>Processing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Speed</strong></td>
</tr>
<tr>
<td>I skip over a source if it takes too long to read.</td>
</tr>
<tr>
<td>It should only take a few steps to locate a good answer to any question.</td>
</tr>
<tr>
<td>If I do not find answers quickly, I stop searching.</td>
</tr>
<tr>
<td><strong>Effort</strong></td>
</tr>
<tr>
<td>I dismiss sources that do not immediately answer my question.</td>
</tr>
<tr>
<td>I usually ignore a source that looks hard to read.</td>
</tr>
<tr>
<td>I do not need to try to remember any content, as long as I know where to find it again.</td>
</tr>
<tr>
<td>Most of the time, I can find what I need in one source.</td>
</tr>
<tr>
<td>I find that the most useful sources are usually the easiest to locate.</td>
</tr>
<tr>
<td>I find it easy to tell whether what I am reading is accurate.</td>
</tr>
<tr>
<td>In general, I find it easy to tell whether a source is likely to be useful.</td>
</tr>
<tr>
<td>It is a good idea to put in some effort to evaluate what you are reading.</td>
</tr>
<tr>
<td><strong>Context</strong></td>
</tr>
<tr>
<td>My familiarity with a topic affects how I look for answers.</td>
</tr>
<tr>
<td>How interested I am in a topic affects how I evaluate what I read.</td>
</tr>
<tr>
<td><strong>Acquisition</strong></td>
</tr>
<tr>
<td>Given enough effort, I can find the answer to any question.</td>
</tr>
<tr>
<td>Getting answers is just a matter of accessing the right sources.</td>
</tr>
<tr>
<td>I often get more from what I read than what I was originally expecting to learn.</td>
</tr>
<tr>
<td>I enjoy encountering new ideas when I read.</td>
</tr>
<tr>
<td><strong>Evaluation</strong></td>
</tr>
<tr>
<td>I question much of what I read in books.</td>
</tr>
<tr>
<td>I question much of what I read online.</td>
</tr>
<tr>
<td>When reading, it is always important to consider the author's purpose.</td>
</tr>
<tr>
<td>Before I use content from a particular source, I consider the trustworthiness of the source.</td>
</tr>
<tr>
<td>I usually evaluate the accuracy of the facts presented in what I read.</td>
</tr>
<tr>
<td><strong>Location</strong></td>
</tr>
<tr>
<td>When looking for answers to my questions, I rarely use books.</td>
</tr>
<tr>
<td>If I cannot find answers online, I do not usually search anywhere else.</td>
</tr>
<tr>
<td>Anything you need to find can be found online.</td>
</tr>
<tr>
<td>There is a real difference in the quality of content online and in print.</td>
</tr>
<tr>
<td><strong>Use</strong></td>
</tr>
<tr>
<td>Long explanations are less useful to me than just the facts.</td>
</tr>
<tr>
<td>The point of gathering facts is so that I can make up my own mind.</td>
</tr>
<tr>
<td><strong>Storage</strong></td>
</tr>
<tr>
<td>I do not worry about remembering what I read in books.</td>
</tr>
<tr>
<td>I do not worry about remembering what I read online.</td>
</tr>
</tbody>
</table>
Complexity
I do not like answers that begin with "it depends."
I prefer a straight "yes" or "no" answer to a question.
I enjoy investigating questions that require consideration of multiple aspects. R

Stability
The best sources are the most current sources.

Size
I like being able to access a lot of material on any topic. R

Community

Ethics
In forming my opinion, it is my responsibility to evaluate whether an author's arguments are well grounded in evidence. R
It is my responsibility to make sure that what I read is accurate before using it. R
Using someone else's words or ideas is not a big deal.

Authority
The best authority on an event is someone who is directly witnessing it.
It is more useful to consider what regular people think than what experts think.
If most people agree on something, it is probably true.

Note: R indicates reverse-coded items.
Table 2
*Items Organized by Means Across Contexts*

<table>
<thead>
<tr>
<th>Items problematic for both contexts (mean &gt; 50.5)</th>
<th>School Mean</th>
<th>Personal Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Activity/acquisition) Given enough effort, I can find the answer to any question.</td>
<td>74.58 (21.78)</td>
<td>72.58 (22.63)</td>
</tr>
<tr>
<td>(Activity/acquisition) Getting answers is just a matter of accessing the right sources.</td>
<td>66.81 (21.93)</td>
<td>70.37 (21.81)</td>
</tr>
<tr>
<td>(Activity/evaluation) I question much of what I read in books. R</td>
<td>65.34 (20.12)</td>
<td>60.03 (24.68)</td>
</tr>
<tr>
<td>(Activity/use) Long explanations are less useful to me than just the facts.</td>
<td>56.69 (26.05)</td>
<td>66.18 (25.79)</td>
</tr>
<tr>
<td>(Activity/location) When looking for answers to my questions, I rarely use books.</td>
<td>60.63 (27.78)</td>
<td>66.42 (27.02)</td>
</tr>
<tr>
<td>(Content/complexity) I do not like answers that begin with &quot;it depends.&quot;</td>
<td>57.26 (26.45)</td>
<td>58.11 (26.37)</td>
</tr>
<tr>
<td>(Content/complexity) I prefer a straight &quot;yes&quot; or &quot;no&quot; answer to a question.</td>
<td>65.40 (24.28)</td>
<td>66.18 (25.79)</td>
</tr>
<tr>
<td>(Content/stability) The best sources are the most current sources.</td>
<td>55.89 (24.32)</td>
<td>65.48 (24.61)</td>
</tr>
<tr>
<td>(Community/authority) The best authority on an event is someone who is directly witnessing it.</td>
<td>63.77 (21.99)</td>
<td>65.61 (24.90)</td>
</tr>
<tr>
<td>(Processing/effort) I dismiss sources that do not immediately answer my question.</td>
<td>51.45 (26.31)</td>
<td>56.39 (27.44)</td>
</tr>
<tr>
<td>(Processing/effort) I usually ignore a source that looks hard to read</td>
<td>59.14 (25.61)</td>
<td>63.06 (26.66)</td>
</tr>
<tr>
<td>(Processing/speed) I skip over a source if it takes too long to read.</td>
<td>64.84 (22.61)</td>
<td>66.88 (25.71)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Items differing across contexts (mean &lt; 50.5 for school, &gt; 50.5 for home)</th>
<th>School Mean</th>
<th>Personal Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Community/authority) It is more useful to consider what regular people think than what experts think.</td>
<td>41.53 (21.01)</td>
<td>55.00 (25.88)</td>
</tr>
<tr>
<td>(Activity/location) If I cannot find answers online, I do not usually search anywhere else.</td>
<td>42.20 (31.14)</td>
<td>52.03 (30.73)</td>
</tr>
<tr>
<td>(Activity/location) Anything you need to find can be found online.</td>
<td>47.03 (29.78)</td>
<td>58.52 (28.76)</td>
</tr>
<tr>
<td>(Processing/speed) It should only take a few steps to locate a good answer to any question.</td>
<td>43.25 (26.15)</td>
<td>59.61 (26.61)</td>
</tr>
<tr>
<td>(Processing/effect) I do not need to try to remember any content, as long as I know where to find it again.</td>
<td>41.35 (25.58)</td>
<td>55.28 (27.78)</td>
</tr>
<tr>
<td>(Processing/effect) Most of the time, I can find what I need in one source.</td>
<td>44.63 (24.96)</td>
<td>54.95 (26.71)</td>
</tr>
<tr>
<td>(Processing/effect) I find that the most useful sources are usually the easiest to locate.</td>
<td>49.73 (26.89)</td>
<td>56.07 (27.57)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Items adaptive for both contexts (mean &lt; 50.5)</th>
<th>School Mean</th>
<th>Personal Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Activity/use) The point of gathering facts is so that I can make up my own mind. R</td>
<td>33.30 (21.09)</td>
<td>26.46 (19.44)</td>
</tr>
</tbody>
</table>
- **Activity/location**: There is a real difference in the quality of content online and in print. R  
  - (Activity/location) 46.01 (26.31)  
  - 42.43 (25.64)

- **Activity/storage**: I do not worry about remembering what I read in books.  
  - (Activity/storage) 33.70 (23.61)  
  - 43.41 (26.81)

- **Activity/storage**: I do not worry about remembering what I read online.  
  - (Activity/storage) 43.46 (23.31)  
  - 49.95 (26.69)

- **Activity/acquisition**: I often get more from what I read than what I was originally expecting to learn. R  
  - (Activity/acquisition) 33.57 (20.14)  
  - 30.25 (20.06)

- **Activity/acquisition**: I enjoy encountering new ideas when I read. R  
  - (Activity/acquisition) 23.62 (17.81)  
  - 21.08 (17.77)

- **Activity/evaluation**: I question much of what I read online. R  
  - (Activity/evaluation) 44.88 (23.62)  
  - 42.56 (26.48)

- **Activity/evaluation**: When reading, it is always important to consider the author's purpose. R  
  - (Activity/evaluation) 28.13 (19.11)  
  - 29.14 (21.36)

- **Activity/evaluation**: Before I use content from a particular source, I consider the trustworthiness of the source. R  
  - (Activity/evaluation) 30.55 (22.52)  
  - 34.32 (24.69)

- **Activity/evaluation**: I usually evaluate the accuracy of the facts presented in what I read. R  
  - (Activity/evaluation) 39.95 (22.17)  
  - 36.85 (24.02)

- **Content/complexity**: I enjoy investigating questions that require consideration of multiple aspects. R  
  - (Content/complexity) 45.35 (26.44)  
  - 39.73 (25.30)

- **Content/size-complexity**: I like being able to access a lot of material on any topic. R  
  - (Content/size-complexity) 21.10 (16.57)  
  - 20.63 (16.44)

- **Processing/effort**: I find it easy to tell whether what I am reading is accurate. R  
  - (Processing/effort) 50.12 (22.90)  
  - 39.38 (21.06)

- **Processing/effort**: In general, I find it easy to tell whether a source is likely to be useful. R  
  - (Processing/effort) 37.32 (20.25)  
  - 36.35 (20.90)

- **Processing/effort**: It is a good idea to put in some effort to evaluate what you are reading. R  
  - (Processing/effort) 23.04 (16.33)  
  - 28.67 (21.15)

- **Processing/context**: My familiarity with a topic affects how I look for answers. R  
  - (Processing/context) 25.87 (17.67)  
  - 22.97 (17.88)

- **Processing/context**: How interested I am in a topic affects how I evaluate what I read. R  
  - (Processing/context) 21.84 (18.90)  
  - 20.04 (16.76)

- **Processing/speed**: If I do not find answers quickly, I stop searching.  
  - (Processing/speed) 37.03 (25.27)  
  - 46.50 (28.13)

- **Community/ethics**: In forming my opinion, it is my responsibility to evaluate whether an author's arguments are well grounded in evidence. R  
  - (Community/ethics) 27.01 (16.69)  
  - 28.86 (18.79)

- **Community/ethics**: It is my responsibility to make sure that what I read is accurate before using it. R  
  - (Community/ethics) 22.88 (19.05)  
  - 26.67 (20.40)

- **Community/ethics**: Using someone else's words or ideas is not a big deal.  
  - (Community/ethics) 23.74 (22.96)  
  - 38.59 (32.13)

- **Community/authority**: If most people agree on something, it is probably true.  
  - (Community/authority) 40.03 (25.15)  
  - 47.80 (28.05)

Note: R indicates reverse-coded items. Lower scores indicate more adaptive beliefs. Scale ranges from 1 to 100.
Figure 1. Shot of the computer screen with directions for the completion of the BAIQ-S and sample item.

Directions
Please respond to the following 43 statements by making a mark (X) on the line. Indicate how much you agree or disagree with the given statement by clicking on the line in the spot where you want to make your mark between strongly disagree (SD) and strongly agree (SA). An X will briefly appear where you first click and then you will be moved onto the next question. You will not have a chance to move your X once you click on the line, and remember: Please do not click your back button.

If the page takes longer than 10 seconds to load, please hit the refresh button.

For this set of questions, please rate your agreement according to what you think and do when you are engaged in school-related activities and tasks.

Sample: When I read, I talk to myself.

Strongly Disagree [---------------------------------------------------------------X---------------] Strongly Agree

For School-related Activities...

1. I can find what I need online easier than in a book.

Strongly Disagree [---------------------------------------------------------------] Strongly Agree
Figure 2. Frequency distributions of average scores on the (a) BAIQ-S and (b) BAIQ-P.

a.

![BAIQ-S Frequency Distribution](image)

b.

![BAIQ-P Frequency Distribution](image)