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Epistemological beliefs and the information-seeking behavior of undergraduates

Ethelene Whitmire

School of Library and Information Studies, University of Wisconsin-Madison, Helen C. White Hall #4226, 600 North Park Street, Madison, WI 53706, USA.
E-mail address: ewhitmire@facstaff.wisc.edu (E. Whitmire).

Abstract

This study explores the relationship between undergraduates' epistemological beliefs and their information-seeking behavior. Kuhlthau's information search process (ISP) model and four models of epistemological development from educational psychology formed the theoretical foundation of this investigation. Twenty undergraduates attending an Ivy League university were interviewed about their search process as they completed a major research paper during their senior year. Epistemological beliefs affected topic, the use of mediators, search techniques, the evaluation of information, and the ability to recognize authority. Epistemological beliefs also affected several stages of the ISP model: topic selection, prefocus formulation, focus formulation, and collection. These findings provide a rich theoretical foundation for future information-seeking behavior research and will assist academic reference librarians by providing insights into the impact of undergraduates' epistemological beliefs on their information-seeking behavior.

1. Introduction

Undergraduates encounter much information during their quest for sources useful in completing research papers. Their views about knowledge and how they construct it have implications for their information-seeking behavior. Researchers who study epistemology[1] are interested in "how individuals come to know, the theories and beliefs they hold about knowing, and the manner in which such epistemological beliefs they hold about knowing,

[1] The philosophical study of the nature, sources, and limits of knowledge (Moser, Mulder, & Trout, 1998).

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and the manner in which such epistemological premises are a part of and an influence on the cognitive processes of thinking and reasoning" (Hofer & Pintrich, 1997, p. 88).

Undergraduates' epistemological beliefs should influence the decisions they make as they seek information and evaluate information sources encountered during the information-seeking process. The questions guiding this study are as follows: (1) What are undergraduates' epistemological beliefs? and (2) What is the relationship between these beliefs and their information-seeking behavior?

Answers to these research questions have both theoretical and practical value. There is currently no research in the library and information science (LIS) literature about the role of epistemology on information-seeking behavior; this study's findings can help academic reference librarians understand how individuals' epistemological beliefs affect different aspects of information-seeking behavior.

2. Literature review

Four major epistemological development theories from educational psychology inform this study and provide part of the theoretical foundation. Kuhlthau's (1993) information search process (ISP) model provides the other part of this theoretical foundation.

2.1. Scheme of intellectual and ethical development

Perry's (1970) scheme of intellectual and ethical development is recognized as the first study of college undergraduates' intellectual development. All subsequent models of adult epistemological development can trace their origins to this scheme. From interviews with primarily White, male undergraduates from Harvard beginning in the 1950s and 1960s, he suggested that undergraduates go through a series of positions. Using responses to open-ended interviews, this scheme groups the nine positions into four clusters. Undergraduates' views of knowledge at each stage can be described as follows:

Dualism:	all knowledge is known. Further, there is certainty that right and wrong answers exist for everything.
Early multiplicity:	most knowledge is known. All is knowable. Certainty that there exists a right way to find the right answers.
Late multiplicity:	in some areas, there is certainty about knowledge. In most areas, there is uncertainty.
Contextual relativism:	all knowledge is contextual. All knowledge is disconnected from any concept of absolute truth. Right and wrong, adequate and inadequate, appropriate and inappropriate, however, can exist within a specific context and are judged by a "rule of adequacy" that is determined by expertise and good thought processes (Perry, 1999, introduction).

2.2. Women's ways of knowing model

Belenky, Clinchy, Goldberger, and Tarule (1986) challenged Perry's elite male sample as not representative and conducted interviews with women culminating in the women's ways of knowing model of female epistemological development. This model contained five perspectives "from which women view reality and draw conclusions about truth, knowledge, and authority" (Belenky et al., 1986, p. 3). The theoretical foundations for this study and model included Perry's scheme of intellectual and ethical development and the work of Gilligan (1982) on women's development of moral reasoning in a "different voice" model, created in response to Kohlberg's (1971, 1981) theory of moral development. Belenky et al. (1986) used Perry's (1970) approach of open-ended interviews. Embedded questions were designed to test theories by Perry (1970), Gilligan (1982), and Kohlberg (1971, 1981).

Belenky et al. (1986) interviewed 135 women about their experiences as learners and as knowers and about how they have changed. Interviews lasted 2 to 5 hours. The interviewers took a phenomenological approach by using broad questions that allowed the women to describe their experiences with their own words. The women were in academic institutions and "invisible colleges" (e.g., human services agencies).

The authors derived their model from these interviews. Their model has five stages:

Silence:	a position in which women experience themselves as mindless and voiceless and subject to the whims of external authority.
Received knowledge:	a perspective from which women conceive of themselves as capable of receiving, even reproducing, knowledge from the all-knowing external authorities but not capable of creating knowledge on their own.
Subjective knowledge:	a perspective from which truth and knowledge are conceived as personal, private, and subjectively known or intuited.
Procedural knowledge:	a position in which women are invested in learning and applying objective procedures for obtaining and communicating knowledge.
Constructed knowledge:	a position in which women view all knowledge as contextual, experience themselves as creators of knowledge, and value both subjective and objective strategies for knowing (Belenky et al., 1986, p. 15).

2.3. The epistemological reflection model

Baxter Magolda (1992) developed the epistemological reflection model, which addressed the gender differences found in the two previous models. She tested men and women using the same instrument, the Measure of Epistemological Reflection (MER), which was designed to measure Perry's (1970) scheme longitudinally.

The epistemological reflection model is "based on the undergraduates' perceptions of the nature of knowledge, it describes the four ways of knowing and their development throughout the college experience" (Baxter Magolda, 1992, p. xii). The model contains four stages of knowing:

Absolute: knowledge is certain or absolute.
Transitional: knowledge is partially certain and partially uncertain.
Independent: knowledge is uncertain — everyone has own beliefs.
Contextual: knowledge is contextual; judge on basis of evidence in context (p. 30).

2.4. The reflective judgment model

King and Kitchener (1994) developed the final epistemological model used in the theoretical framework. The model examines "the ways that people understand the process of knowing and the corresponding ways they justify their beliefs about ill-structured problems" (p. 13). Their model continues where Perry's (1970) scheme ended, with the final phase of their model — reflective thinking. According to Kurfiss (1988), the reflective judgment model is more epistemologically rigorous than Perry's (1970) scheme.

King and Kitchener (1994) measured reasoning ability with the Reflective Judgment Interview (RJI). Undergraduates were presented with a series of tasks (i.e., ill-structured problems) and asked to describe their position on the topic and the reasoning behind this position.

The reflective judgment model has seven stages that are divided among three phases. In Phase 1, undergraduates demonstrate pre-reflective thinking -representing Stages 1 to 3 -and believe that there are right and wrong answers and that only authorities know the right answers. In Phase 2, undergraduates demonstrate quasi-reflective thinking representing Stages 4 and 5, and they begin to question their previously held assumptions and realize that authorities can be wrong or biased. Undergraduates realize that there can be more than one "correct" answer to a problem. Undergraduates in Phase 3 illustrate reflective thinking containing Stages 6 and 7 and believe "knowledge must be understood in relationship to the context in which it was generated" (King & Kitchener, 1994, p. 17).

Table 1 displays the stages of epistemological development of the four models and exhibits their relationship with each other. According to Hofer and Pintrich (1997), the models by Perry (1970), Belenky et al. (1986), and Baxter Magolda (1992) focus on how undergraduates' epistemological beliefs influence their interpretation of their educational experiences. The model by King and Kitchener (1994) examines how undergraduates' epistemological beliefs affect thinking and reasoning ability.

All four models are developmental. Undergraduates progress through a series of stages or positions in a hierarchical fashion. In the beginning of their college careers, undergraduates often have an absolutist, right-and-wrong view of knowledge. Through their college experiences (curricular and extracurricular), undergraduates begin to perceive knowledge as relative and contingent on the context in which it was created.

Table 1
Models of epistemological development

Level	Intellectual and ethical development, Perry (1970)	Women's ways of knowing, Belenky et al. (1986)	Epistemological reflection, Baxter Magolda (1992)	Reflective judgment, King and Kitchener (1994)
Low	Dualism	Silence Received knowledge	Absolute knowing	Prereflective thinking
Medium	Early multiplicity Late multiplicity	Subjective knowledge Procedural knowledge	Transitional knowing Independent knowing	Quasi-reflective thinking
High	Contextual relativism	Constructed knowledge	Contextual knowing	Reflective thinking

From "The development of epistemological theories: Beliefs about knowledge and knowing and their relation to learning," by B. K. Hofer and P. R. Pintrich, 1997, *Review of Educational Research*, *92*.

2.5. The information search process model

Kuhlthau's (1993) ISP model forms the other dimension of the theoretical foundation of this investigation. She defined the information search process as "the user's constructive activity of finding meaning from information in order to extend his or her state of knowledge on a particular problem or topic" (Kuhlthau, 1991, p. 361). Kuhlthau developed this model by using Belkin's (1980) anomalous states of knowledge, Kelly's (1963) phases of construction, and Taylor's (1968) levels of needs as theoretical bases.

Kuhlthau initially developed the model by interviewing high-achieving high school seniors as they completed term papers. Data analysis techniques included observations, journals, search logs, time lines, flowcharts, and in-depth interviews with a selected number of subjects. She analyzed these data to determine what students did and what they felt while they completed the term paper assignment. The stages of the ISP model are as follows: (1) task initiation, (2) topic selection, (3) prefocus exploration, (4) focus formulation, (5) collection, and (6) presentation. The present study used this ISP model to examine undergraduates' information-seeking behavior while using the previously mentioned epistemological development models to determine undergraduates' epistemological beliefs.

From the review of the epistemological development theories, this study hypothesizes that individuals rated in the lower levels of epistemological development would reject conflicting information while believing that if something was in print or on the Web that it must be valid. Subjects rated in the medium range of epistemological development would begin to believe that uncertainty exists and that two authors can have differing views on the same subject and that both could be correct. These undergraduates would not reject conflicting information. They might believe, however, that knowledge reflects personal beliefs and not reasoned judgments and that the authors are entitled to their own beliefs. Undergraduates rated at the highest levels of epistemological beliefs would evaluate information based on the logical reasoning ability of the authors. These individuals would begin to think of themselves as capable of creating knowledge and using their own viewpoints to select or reject information sources. They would also consider the context in which the information was formulated and begin to recognize the credibility of particular publishers or journals, and so forth.

3. Procedures

The following section describes the subjects, the study setting, and the data analysis technique.

3.1. Subjects and setting

Twenty seniors (fourth-year undergraduates) attending Yale University, a highly selective Research I Ivy League institution in the United States, were interviewed during the spring 1999 term. The participants included 14 female and 6 male undergraduates of various ethnic backgrounds including 16 Whites, 3 Asian Americans (Vietnamese, Thai, and Korean), and 1 multiracial undergraduate (French-Canadian/Korean). The average age of the subjects was approximately 22 years. The undergraduates' declared majors were comparative literature, English, history, anthropology, psychology, sociology, biology, chemistry, and computer science, representing the humanities ($n = 8$), the social sciences ($n = 9$), and the natural and applied sciences ($n = 3$). At the time of the study, these undergraduates had either completed or were in the process of completing a senior essay or senior project, a major research paper required by most undergraduate academic departments.

These subjects represented a sample of convenience (Miles & Huberman, 1994). An e-mail requesting subjects was distributed by academic departments or faculty members in charge of organizing the senior essays for their academic department. These faculty members submitted names to the researcher. Subjects also recommended their friends or roommates for participation in the study.

Interviews were used to understand undergraduates' information-seeking behavior. Several embedded questions were designed to assess the subjects' epistemological beliefs. The 30- to 45-minute interviews were conducted in two of the university's multiple academic libraries. Undergraduates were compensated with either a $10 photocopy card for use in the libraries or a gift certificate to the university bookstore. Participants answered 11 questions about their information-seeking behavior while completing their essay or project. The following pivotal interview questions focused specifically on issues related to undergraduates' epistemological beliefs: (1) How did you decide which sources were good for your senior essay?, (2) What criteria did you use for choosing sources? and (3) If you came across sources you disagreed with, or two sources that contradicted each other, how did you handle that? The Appendix contains the complete set of interview questions.

3.2. Data analysis

The audiotapes were transcribed. The coding and data analyses consisted of seeking evidence about (1) undergraduates' epistemological beliefs and (2) the influence of undergraduates' epistemological beliefs on their information-seeking behavior using content analysis of interview data (Weber, 1990). This method of data analysis consists of several stages: (1) defining the recording units, (2) defining the categories, (3) test coding on sample

of text, (4) assessing accuracy and reliability, (5) revising the coding rules, (6) returning to step 3, (7) coding all the text, and (8) assessing achieved reliability or accuracy.

None of the four models of epistemological development was used explicitly for data analysis. All of the models, however, were used implicitly to analyze the interview data for evidence of epistemological beliefs. The lengthy and open-ended interviews conducted by Perry (1970) and Belenky et al. (1986) were difficult if not impossible to replicate. Likewise, the RJI developed by King and Kitchener (1994) required extensive training and scoring by multiple trained researchers. The MER created by Baxter Magolda (1992) was not used because this study was a pilot test designed to determine if there could be a measurable relationship between these two concepts. Nevertheless, the authors of all four models provided extensive information about the criteria used to assess the epistemological beliefs of their subjects and this study used the two pivotal interview questions to determine the subjects' epistemological beliefs while also considering their responses to the other interview questions involving the role of peers, faculty, librarians, topic selection, and so forth.

For the purpose of this study and for data analysis, the stages were divided into three sections representing low, medium, and high epistemological development levels. The medium level has two dimensions that represent how undergraduates often straddle between low and high epistemological development levels as they develop epistemologically. The subjects were placed into categories based on their ability to recognize authoritative information sources and whether or not they believed that knowledge was contextual.

4. Results

After conducting content analyses of the interview data, each subject was placed into an epistemological development category. None of the 20 subjects was placed into the low category. This is consistent with other research that indicated few undergraduates enter college with low epistemological development. Five of the undergraduates were placed in the high epistemological development category, followed by 12 undergraduates in the medium-high category and 3 undergraduates in the medium-low category. See Table 2 for the results of the analyses of the interview data.

The following sections relate the finding to the stages of Kuhlthau's ISP model and integrate epistemological development analyses.

4.1. Stage 1 — task initiation — to recognize a need for information

The first stage in the ISP model is task initiation. The task of writing a senior essay commenced with a requirement that undergraduates had to fulfill to complete their majors. Although this task an imposed query (Gross, 1999), undergraduates were allowed to select their own topic. Topic selection was influenced by a variety of experiences, including previous classes, work, and travel experiences. Epistemological beliefs did not appear to influence this stage of the information search process.

Table 2
Subjects in the study

Subjects	Gender	Academic discipline	Epistemological development level
1	Male	Biology	Medium-high
2	Female	Anthropology	Medium-high
3	Female	Psychology	Medium-high
4	Male	Anthropology	High
5	Female	English	Medium-high
6	Female	History	Medium-high
7	Female	Anthropology	High
8	Female	History	Medium-low
9	Female	English	High
10	Female	Literature	Medium-high
11	Female	Sociology	Medium-low
12	Female	Anthropology	Medium-high
13	Female	Chemistry	Medium-high
14	Female	Psychology	High
15	Female	Psychology	Medium-high
16	Male	Sociology	Medium-high
17	Male	Computer science and math	Medium-low
18	Male	English	High
19	Male	Comparative literature	Medium-high
20	Female	Comparative literature	Medium-high

4.2. Stage 2 — topic selection — to identify and select the general topic to be investigated or the approach to be pursued

The second stage in the ISP model is topic selection. The subjects selected a variety of topics.[2] Most undergraduates were required to complete and submit a short one-sentence or one-paragraph statement indicating the topic they selected before beginning the essay. Although Kuhlthau (1993) indicated that many students find this stage very stressful, none of the subjects in this study indicated any stress related to this stage. It appears that this assignment was used to encourage undergraduates to make a decision about their topic, but

[2] For example, Jews in Italy under Fascism, oral art in Vietnam and postwar identity, illustrated Dickens' novels and the relationship between the text and visuals, a historiography of a home economist during the progressive era, V.S. Naipaul and postcolonial and Caribbean literature, colonialism and Marguerite Duras' *The Lover* and Doris Lessing's *Golden Notebook*, plants and natural gene defense mechanisms, 17th century Springfield, Massachusetts' Native American population, measuring the relationship between depression and anxiety and the quality of marriage, a heat-related sickness in Haiti, welfare reform, language acquisition of new Israeli immigrants, combinatorial chemistry, post-traumatic stress disorder in children, the relationship between marital discord and depression, a comparison of two films about the Battle of Algiers and Italian Imperialism, the role of e-mail in organizations, a literary reading of the philosophy and theology of Ralph Cudworth, and John Donne's First Anniversary and astronomical innovations.

many undergraduates noted that they knew in advance that their stated topic was negotiable and they often changed their topics. One undergraduate stated that he was told, "you'll never end up studying what you planned on studying so stay flexible."

Many undergraduates selected topics based on their racial/ethnic and/or religious background. One undergraduate selected a topic about a Native American tribe from her hometown. Many of the undergraduates identified themselves as being Jewish and selected related topics for their essays. It appeared that on at least two occasions, however, undergraduates allowed their faculty to pick a topic for them. Both of these subjects were rated as medium-low epistemological believers. One of these undergraduate students indicated that her topic "hasn't changed as much as it should have" and that her faculty advisor did the information searching for her. Another undergraduate who allowed the faculty member to select his topic was so uninterested in his project that he no longer planned to study theory in graduate school and instead chose to concentrate on applied research. In at least one instance, a peer suggested that a medium-high epistemological believer do an analysis of two specific books for her senior essay topic.

4.3. Stage 3 — prefocus exploration — to investigate information on the general topic to extend personal understanding

This third stage of the ISP model is prefocus exploration. During this stage, undergraduates searched for information on their topic. Undergraduates try to fit newly acquired information into their existing knowledge structures. Kuhlthau (1988) found that her subjects encountered the most difficulty at this stage because they encountered information that was inconsistent or incompatible with their existing knowledge.

Often, the information encountered or not encountered during this stage depended on an undergraduate's epistemological beliefs and determined if the undergraduate would continue to pursue the topic. A medium-high epistemological believer majoring in comparative literature stated, "I went through quite a number of different possible topics. I eventually decided that I would do something on [name of author] and after reading [name of author] I decided on that poem." Another medium-high epistemological believer majoring in biology noted that "when I didn't find much information about it [a topic] I moved on to a more broad topic. I was studying a very new technology that there was little published about it." Some topics required undergraduates to search foreign archives and bookstores or to travel abroad for data collection and interviews.

Four types of mediators were useful to undergraduates during this stage: faculty advisors, graduate students working with the faculty, peers, and librarians. Faculty and graduate student advisors were commonly cited as referring undergraduates to particular information sources — for example, "I talked to my professor a lot and she gave me ideas for other books." Another undergraduate said, "I used faculty a lot to get recommendations on books." Other undergraduates used peers for seeking information, to get ideas for their projects, and to discuss their essay, including a medium-high epistemological believer who stated, "friends, I think, other English majors, it was good talking to them." In addition, a comparative literature major who was a medium-high epistemological believer said, "I had a

couple of friends who were English majors with whom I discussed literature in general and they both had thoughts as I went along. It was good to use them as a sounding board to hear what my own ideas sounded like.''

Undergraduates used the bibliographies in the information sources to find other sources or what Ellis (1993) labeled ''citation chaining.'' A medium-high epistemological believer and English major described finding additional information sources by looking at bibliographies as a ''chain reaction.'' One undergraduate said she ''looked in the references section and if they mentioned something that seemed to be a key paper then I would want to go look that up.'' After attending a database-searching class, a medium-high epistemological believer majoring in sociology was unable to find many information sources by doing keyword searching. He said it was most helpful to follow citations and flip through journals' tables of contents, what Bates (1989) characterized as ''journal run'' searching in her berry-picking model. The most common information-seeking activities were citation chaining, browsing the stacks, and browsing journals. An anthropology major and high epistemological believer commented, ''I've gone through the ethnomusicology journal for the past ten years.'' Another anthropology major who was a medium-high epistemological believer found a pivotal article and describes the process as ''I was just randomly looking through a journal and found this article. Actually that was the best way, just to look through every single one [every issue].'' Another undergraduate said, ''I used [the online public access catalog] and indexes in books or bibliographies in books that I had read on [my topic]'' to find additional materials for her search.

A few undergraduates mentioned asking reference librarians for assistance. For example, an English major who was a high epistemological believer combined her interests in literature with art history and needed to find illustrated novels. The reference librarian taught her how to read the catalog entries to determine if an edition was illustrated. A biology major who was a medium-high epistemological believer was referred to a particular librarian by his faculty advisor. Together, they conducted an exhaustive search of the electronic indexes in his academic discipline. He was very satisfied with his encounter: ''[the librarian] helped me instead of wasting weeks'' searching for materials. Another undergraduate consulted with a reference librarian to confirm that he had conducted a thorough search.

Most undergraduate searches at this stage consisted of searching the online public access catalog and searching for journal articles. A few bought books while they were abroad. Many mentioned that they were able to locate almost all of their information sources in the library's holdings, which is one of the largest academic libraries in the United States. Undergraduates generally were not interested in interlibrary loans and few mentioned using the Web at all. Undergraduates did not appear to know how to conduct very advanced or sophisticated catalog searches and relied heavily on keyword searching. Searching for journals appeared to be an even more unfamiliar skill. A computer science/math major who was a medium-low epistemological believer might have benefited from searching for journals but stated, ''I still do not know how to.'' He continued, ''I never had to look up a journal or maybe I should have but just didn't.'' Another undergraduate said she did not look for journal articles because of laziness and she also did not know how. There were many comments about how frustrating it

was to search for journals in electronic indexes and although two undergraduates attended bibliographic instruction sessions, this did not lead to successful searches. Undergraduates also complained about how difficult it was to locate journals in what many considered to be the main library, where journals were located in multiple areas of the library. Undergraduates who had to find journals in another library expressed satisfaction with this library because the journal collection was in one central location in alphabetical order, not call number order. Some undergraduates were so frustrated with using electronic indexes to find articles that they simply physically searched several years of the bound volumes of journals that they identified as important in their field. A sociology major who was a medium-high epistemological believer went to the library to browse the current journals section and found a journal that contained the keywords he was using in his searches in the electronic databases from his residence hall.

4.4. Stage 4 — focus formulation — to form a focus from the information encountered

The fourth stage of the ISP model is focus formulation. Kuhlthau (1991) described this as a turning point "when feelings of uncertainty diminish and confidence increase" (p. 367). Undergraduates were asked to identify a pivotal point in their project when their research took a sudden turn. A medium-low epistemological believer majoring in history reached a turning point in her project during the holiday break when she had nothing to do other than to read the books that she borrowed from the library. She took notes and realized what her topic was about. She was able to carry out a more focused information search after this point.

Frequently talking about their project helped undergraduates to focus. An anthropology major who was a medium-high epistemological believer narrowed her six topics to one topic "based upon the more I talked about it [my topic] the more I formulated what my ideas were." Another undergraduate said that after talking with her faculty advisor, she began to understand her topic. The best thing for a high epistemological believer in anthropology was "talking with my professor, because I have so much information [to plow through]."

This same undergraduate described her information search process using terms found in Dervin's (1977) model. She said she sought information by "ideally asking myself questions and then where the gaps are to look for information there." She sought information to fill the gaps in her existing knowledge. She found searching for information easier after finding her focus, "I think in general research only becomes really useful after you hit this focus point."

4.5. Stage 5 — collection — to gather information related to the focused topic

This fifth stage occurs after the pivotal moment when undergraduates begin to focus on a specific topic. Undergraduates used a variety of criteria for evaluating information found at this stage. To assess their epistemological beliefs, they were asked to describe what they did when they encountered conflicting information and information about how they assessed the authority of their information sources.

Encountering information that was inconsistent with their thesis did not seem to trouble most undergraduates. A high epistemological believer majoring in English said that when she encountered this type of information "it really didn't throw me off or change my essay." A medium-high epistemological believer majoring in history was not able to determine the validity of her sources and relied on her faculty advisors' assistance, "I used the major works. My advisors were like 'these are the ones you should really look at.'"

One undergraduate excluded journals based on whether they had political slants or stances. A medium-high epistemological believer majoring in anthropology used a similar method to select journals: "I usually trusted the later sources because there's a lot of bias in the earlier sources, like anti-Native American and usually it is really easy to identify that bias." Another undergraduate was comfortable about recognizing authoritative journals, "some always pop up, they're huge, famous journals," but then she countered, "I don't, I haven't got enough like expertise." This same undergraduate acknowledged that she had to fight the temptation to just disregard conflicting material.

Other undergraduates felt more comfortable about assessing the authority of their information sources. A high epistemological believer majoring in psychology recognized that "there are some journals like I said before that are really good and are known to be really good and if they [the articles] are in there it's probably worthwhile." Another psychology major who was a medium-high epistemological believer said that she would not retrieve an article from an obscure journal because if the article was good it would be in a better journal. A medium-high epistemological believer majoring in anthropology made a chart of the pros and cons of each argument to help her to process the information. Conflicting information did not bother her; in fact, she said, "I welcomed it."

A high epistemological believer majoring in anthropology used his experiences living in a foreign country to view the information he encountered. He was concerned that his research subjects were accurately represented in the information he encountered. He viewed his information sources through his personal lens by integrating this new knowledge with his existing knowledge. He asked himself, "How does this compare with what I saw with my own eyes? How does this compare with the experiences that I know that people were having?"

One undergraduate found that "different sources were giving me different evidence either for or against my thesis," so she made a chart of pros and cons to decide which side made more sense. She eventually included all of the information sources in her essay.

One undergraduate judged the validity of an author's argument by how many other people supported the idea, the author's ability to support his or her ideas, and common sense. Another undergraduate resolved conflicting views by choosing the authors that everyone else selected. A high epistemological believer majoring in English felt comfortable considering himself an expert, "I guess the advantage of doing a literary reading of something is that you can just read it and reach your own opinion as well as the sources can." He said he felt competent enough to criticize published authors.

A medium-low epistemological believer majoring in history described her evaluation criteria as follows: "I guess I just went with the consensus, like if I read three authors and two said one thing." She acknowledged that although "we were supposed to incorporate

diverging opinions, I'm sure I won't get a good grade because I didn't." She admitted that "I have this bad tendency to just reject, you know, to ignore everything that's against my . . . [opinion] which is one way of doing it but it's not really good because then the people who are arguing with my essay as they're reading it aren't going to find intellectual support." This undergraduate met with her faculty advisor when she had difficulty selecting a thesis topic and was given a topic by the faculty advisor. She admitted to only looking for material that would support this thesis.

4.6. Stage 6—presentation—to complete the search and to prepare to present or otherwise use the findings

Few undergraduates were at this stage of the ISP model. A high epistemological believer majoring in anthropology, however, had presented his paper at a conference in Haiti and produced an exhibit. In addition, he had to present the results of his senior essay at his residential college's Mellon Forum, a forum where all the undergraduates presented their senior essays, designed to give undergraduates an opportunity to receive feedback from their peers. A medium-high epistemological believer also majoring in anthropology had not presented at her residential college's Mellon Forum at the time of the interview, but she had attended other presentations and remarked that she found it helpful to hear her peers talk about how they developed their projects and what worked and did not work. The chemistry department also provided a forum for four or five undergraduates to present their senior essays each Friday. The chemistry major in this study was in the process of preparing her presentation and used her prepared slides to discuss her project during the interview.

5. Discussion

This study investigated the relationship between individuals' epistemological beliefs and their information-seeking behavior. The results of the content analyses confirmed the hypotheses about the expected relationship between epistemological beliefs and information-seeking behavior. The relationship between these two constructs manifested itself during several stages of the ISP model, particularly during Stages 2 through 5. Epistemological beliefs affected the following: (1) topic selection, (2) the use of mediators, (3) search techniques, (4) the evaluation of information encountered during the search process, and (5) the ability to recognize authority.

Two of the three individuals rated as medium-low epistemological believers were not engaged in selecting their senior essay topic. Instead, these subjects allowed their faculty advisor to select a topic for them.

Many of the subjects rated as medium-high and high epistemological believers used a variety of individuals as mediators during their search process. Faculty and graduate student advisors, writing tutors, and peers were used during the topic selection and prefocus exploration stages. These mediators also suggested citations for information sources.

Undergraduates often approached academic librarians for help once they hit a wall and could find no further information on their topic. The academic librarians were most often used to verify that undergraduates had completed a thorough search of the library resources during the prefocus exploration stage.

Medium-high and high epistemological believers also used a variety of search techniques, including browsing the stacks, conducting journal runs (i.e., reading the table of contents of a large number of issues of particular journals), and citation chaining (i.e., following citations in bibliographies for additional information sources). Medium-low epistemological believers did not use a variety of techniques. They often searched for information and, when they could not find additional sources, they concluded their search process.

Medium-high and high epistemological believers considered themselves capable of critiquing and evaluating information. These believers used their own knowledge about their topics to evaluate the information that they encountered during the search process and did not reject conflicting information during the collection stage.

Medium-high and high epistemological believers were able to recognize authoritative sources such as important journals in their field of study and the political biases and agendas of authors.

This study has both practical and theoretical implications. These findings have practical implications for reference librarians in academic libraries. Depending on an undergraduate's epistemological beliefs, he or she will be more or less likely to ask for reference assistance for finding information sources for academic assignments during the prefocus exploration stage. Undergraduates who are at the higher stages of epistemological development are more likely to seek assistance from reference librarians.

These findings also have theoretical implications for LIS researchers. The examination of the relationship between epistemological beliefs and information-seeking behavior is in its infancy. Few LIS researchers are exploring this important area. One major exception is the work by Hjorland (2002). Understanding individuals' epistemological beliefs provides improved theoretical explanations about individuals' information-seeking behavior.

6. Conclusion

This study is an initial examination of the relationship between epistemological beliefs and information-seeking behavior. Additional research would benefit from the use of instruments such as the RJI or the MER to measure epistemological beliefs in conjunction with personal interviews to provide triangulation. Future research should also include the exploration of the relationship between these two concepts in digital environments.

Longitudinal studies would also be useful because epistemological beliefs are developmental and change during college based on undergraduates' exposure to a variety of learning and social activities. In addition, the connection between various background characteristics, such as gender, socioeconomic status, and disciplinary differences, and epistemological beliefs are useful avenues for further exploration. These relationships may affect an individual's information-seeking behavior and epistemological beliefs.

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Appendix. Interview questions

1. Tell me about your senior essay. What is it about?
2. How did you decide to examine this particular topic?
3. Let's draw an imaginary time line or chronology of the project so that we can talk about things you did in sequence. I'm interested in the steps you took that didn't work out, as well as the things that did. How did you get started?
4. Can you identify any pivotal points in the project when your research took a sudden turn?
5. Thinking about your list of sources in the bibliography, how did you find the information that you needed?
6. Did you use particular databases? Which ones? Were they helpful?
7. How did you decide which sources were good for your senior essay? What criteria did you use for choosing sources?
8. If you came across sources you disagreed with or two sources that contradicted each other, how did you handle that?
9. What factors (i.e., people or things) played the most important role in developing your senior essay?
10. Would you do any part of the process differently? Did you learn anything of value along the way to improve your strategy?
11. Is there anything else about your academic library experiences that we have not talked about?

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