

## The Correlation between Knowledge Assumptions and the Gathering of Research Information among South African Doctoral Students

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**ABSTRACT** This article, based on a qualitative case study among a group of ten enrolled South African doctoral students, explored the correlation between their knowledge assumptions and their respective behaviour during research information gathering activities while compiling their research proposals for the doctorate. The ten participants interviewed were all doctoral students from the College of Education at the University of South Africa. Six divergent models of epistemological development from the research literature (in chronological order) as well as an information search process model formed the conceptual, theoretical framework for the investigation. The findings of this study provide insights into the impact of students' epistemological beliefs on their information seeking patterns and provide, in addition, a rich theoretical foundation for future information-seeking behaviour research among doctoral students. The findings furthermore confirm the correlation between core epistemological beliefs and information gathering patterns amongst South African doctoral students and provide substantial justification for using epistemological beliefs in the supervision of doctoral students.

### INTRODUCTION

Most doctoral students encounter and use loads of information during their quest for sources from the research literature that are useful and meaningful for the completion of their research proposals and ultimately their theses. This process commences immediately after the students have enrolled for their doctoral degrees as they would be expected to compile a research proposal according to specified guidelines. In the period of more than 20 years that the researcher spent supervising doctoral students at the University of South Africa, he came to realise that, for the majority of students, the compiling of their research proposals becomes a complex, daunting, problematic and most often painful experience. One of the main contributing factors in this regard is that some students, even on doctoral level, simply cannot access or gather the information needed for compiling a research proposal in an effective and rational manner. Some students seem to do a little better in this regard, but information-gathering behaviour among these students seems to be influenced by a variety of restraining factors.

According to the research literature (cf. Hannafin and Hill 2007; Chinn 2013), one of these restraining factors that play an important role in students' information-seeking patterns (or lack thereof) is the assumptions about knowl-

edge that each student possesses and, even more important, how the student constructs knowledge. This restraining factor, widely referred to as one's epistemological view or beliefs, has, according to Moser et al. (1998), indeed some huge implications for students' information gathering activities and behaviour.

### Objectives

Although some studies about the epistemological beliefs of undergraduate students such as the Yale study of 1999 (Whitmire 2003) have been conducted earlier in the United States, no research on this issue has been done locally. In order to address this gap in knowledge, the purpose of this study, based on a qualitative empirical correlation study among ten randomly selected doctoral students from the College of Education at the University of South Africa, was to identify the correlation or association between their respective assumptions or beliefs about knowledge and their information seeking approaches.

### Problem Statement

When considering the epistemological beliefs of subjects in a study, it is firstly imperative to consider the stages of change according to

both time and difficulty as well as the level of cognition at each stage with regard to a person's assumptions about knowledge. In this regard, authors such as Hersey and Blanchard (2001) depicted various stages of change during this process. According to them, it is evident that the more complex and difficult a person's assumptions about and beliefs in human nature become, the more time he or she will need for the process. For cognition, a short time period is needed for an assumption, while the difficulty level of the process is low, but for a higher level of assumption such as group and organisational behaviour, the individual needs a much longer time period.

An individual's assumptions about human beings, human learning and human nature also include assumptions about knowledge and the nature of various kinds of knowledge. This means that in line with the hypothesis of the study (see later), there should be a link between these assumptions and the manner in which students gather information for their doctoral studies. This leads to the statement of the problem for this study, which can be phrased as follows:

*How do a doctoral student's assumptions and beliefs about various kinds of knowledge influence his or her information gathering behaviour?*

This main research question deals with issues such as doctoral students' epistemological beliefs and the relationship between these beliefs and their information gathering patterns. Answers to this research question have both theoretical and practical value and can assist supervisors and other academics understand how individuals' epistemological beliefs affect different aspects of information-seeking behaviour among students.

### **Hypothesis for the Study**

This study, based on an earlier similar study of Whitmire (2003), hypothesises that participants rated in the lower levels of epistemological development would reject conflicting information while believing that if something was in print or on the web, it must be valid. Participants 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 students would not re-

ject conflicting information. They might believe, however, that knowledge reflects personal beliefs and that the authors are entitled to their own beliefs. Participants 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 recognise the credibility of particular journals.

## **THEORETICAL FRAMEWORK**

### **Conceptualising the Assumptions about Knowledge**

Researchers who study epistemology are interested in "how individuals come to know, the theories and beliefs they hold about knowing and the manner in which such epistemological beliefs are a part of and an influence on the cognitive processes of thinking and reasoning" (Hofer and Pintrich 1997: 88). Various models or theories of epistemology are discussed in the research literature (Hofer 2000; Whitmire 2003; Chinn 2009, 2013). For the purpose of this study, six epistemological development theories from the literature provide its' theoretical foundation. These were chosen due to their relation with education. In addition, the 'Information Search Process'-model of Kuhlthau (1993) was used to establish the correlation between epistemological beliefs and information seeking patterns. The six epistemological development models or theories will be briefly discussed in chronological sequence. Each of these theories identify different levels or clusters that can be related to the information search process model mentioned above in order to establish the correlation between epistemological beliefs and information seeking patterns among doctoral students.

William Perry's (1970) all-male model of 'intellectual development', developed at Harvard University in the 1970s, will firstly be discussed as it is widely recognised as the first study on university students' intellectual development. All subsequent models of adult epistemological development can trace their origins to this model. Perry (1999) claims (and his claims have since been substantiated by subsequent research) that

male college students ‘journey’ or ‘travel’ through a series of nine ‘stages’ with respect to intellectual development. These stages can be characterised in terms of the male student’s attitude, perceptions and views towards knowledge at each stage. Each stage can, according to Perry (2008), be grouped into four clusters or categories, namely:

- ♦ *Received Knowledge (dualism)*: All knowledge is known and all problems are solvable. Further, there is certainty that right and wrong answers exist for everything and that the student’s task is to learn the right solution and ignore the others.
- ♦ *Subjective Knowledge (multiplicity)*: There are conflicting answers and therefore students must trust their ‘inner voice’ and not external authorities. Early multiplicity refers to those problems with solutions that we know and those problems with solutions we don’t know, while late multiplicity refers to those problems that are unsolvable and therefore it does not matter which (if any) solution you choose.
- ♦ *Procedural Knowledge (relativism)*: All knowledge is contextual and disconnected from any concept of absolute truth. Right and wrong, adequate and inadequate, appropriate and inappropriate, all can exist within a specific context.
- ♦ *Constructed Knowledge (commitment)*: This is the integration of knowledge learned from others with personal experience and reflection. The student makes a commitment and experiences the implications of the commitment. Students realise that commitment is an ongoing and evolving activity.

For the purpose of this study, this means that students start off as ‘dualists’ by accepting information from the world and reacting to it. They subsequently evolve into so-called ‘multiplicists’ after learning things tacitly and have internal ‘feelings’ about things, but not conscious beliefs that can be explained or justified. They then evolve into ‘contextual relativists’ when they can express their intuitions in language and seek justification for them. They finally get to be ‘committers’ when they establish integration of knowledge learned through their own personal reflections (Perry 2008). Each of these four categories will be conceptualised later in conjunction with the information process research model.

The second model to be discussed is that of Belenky et al. (1986) which was developed in the 1980s as a response to Perry’s all-male Harvard model. In this model they challenged Perry’s elite all-male model as not representative (by conducting interviews with women only), culminating in the ‘Women’s ways of knowing’-model of female epistemological development. Belenky et al. (1986) used the same approach as Perry (1970), namely an approach of open-ended interviews and interviewed females about their experiences as learners and about how they have changed during the learning process. The interviewees took a phenomenological approach by using broad questions that allowed female participants to describe their experiences in their own words. This model (Belenky et al. 1986: 4) contains five stages “from which women view reality and draw conclusions about truth, knowledge, and authority”, namely:

- ♦ *Silence*: This stage means total dependence on external authority. This represents often a position in which women experience themselves as mindless and voiceless and are subject to the whims of external authority.
- ♦ *Received Knowledge*: This is a stage and perspective from which women conceive themselves as capable of receiving, and even reproducing, knowledge from the all-knowing external authorities; but are not yet capable of creating it on their own.
- ♦ *Subjective Knowledge*: This is a stage or perspective from which truth and knowledge are conceived by women as personal and private.
- ♦ *Procedural Knowledge*: This is a stage or position in which women invest in learning by applying objective procedures for obtaining knowledge.
- ♦ *Constructed Knowledge*: This represents a stage or position in which women view all knowledge as contextual; experience themselves as creators of knowledge while value both subjective and objective strategies for knowing.

For the purpose of this study, this means that once a female student assumes the general relativity of knowledge, she begins to construct and reconstruct frames of reference. She then feels responsible for examining, questioning and developing the systems that she will use for

constructing knowledge. Each of these five stages will be conceptualised later in the study in conjunction with the information process research model referred to earlier.

The next model or theory to be discussed is that of Schommer (1990). In the late 1980s, Schommer and others argued for an alternative approach to conceptualising people's epistemological beliefs. According to this model, people's epistemological beliefs can be conceptualised according to taxonomy or as a system of more or less 'independent beliefs'.

By system Schommer (1993) means that there is more than one belief to consider, and by more or less independent, she means that a person may be sophisticated in some beliefs of knowledge but not necessarily in others. Schommer (1993) further argues that epistemologies can be separated into a number of independent beliefs and consequently proposed three beliefs that would be termed epistemological beliefs, namely a belief in how 'complex knowledge' is (ranging from complex to simple), a belief in how 'certain knowledge' is (ranging from highly certain to highly uncertain) and a belief in the 'source of knowledge' (knowledge coming from authority). These beliefs are more or less independent from one another, for instance, a person may believe in complex but certain knowledge, complex but uncertain knowledge, simple and certain knowledge or simple but uncertain knowledge. With this in mind, Schommer (1993) identifies the following four beliefs as the most important independent beliefs of human knowledge:

- ♦ *Belief in Simple Knowledge:* Knowledge is best characterised as isolated facts, and people perceive knowledge as separate and unrelated facts.
- ♦ *Belief in Absolute Knowledge:* Knowledge is absolute and people perceive knowledge as a certainty and argue that there is no mistake or error in scientific discoveries.
- ♦ *Belief in Innate Knowledge:* Learning ability is not changeable and people assume that human ability is not the product of achievement and not subject to improvement.
- ♦ *Belief in Quick Learning:* Learning is not a gradual process, but when it happens, it happens quickly, or it does not happen at all.

Each of these four independent beliefs of Schommer will be conceptualised later in the study in conjunction with the information process research model.

Following the work of Schommer at Harvard, Baxter (1992) consequently developed the 'Epistemological Reflection'-model in the 1990s which addressed the gender differences found in the two previous models. She tested both males and females using the same instrument, namely the Measure of Epistemological Reflection (MER). This instrument is a constructed questionnaire to gain an understanding of participants' perspectives on learning and describes four ways or stages of knowing for students and their development throughout the university experience, namely (Baxter 1992: 30):

- ♦ *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.

Each of these four stages will be conceptualised later in the study in conjunction with the information process research model.

King and Kitchener (1994) developed the next epistemological model used in this study, namely the 'Reflective Judgement'-model. This model examines "the ways that people understand the process of knowing and the corresponding ways they justify their beliefs about ill-structured problems" (King and Kitchener 1994: 13). Their model continues where Perry's (1970) scheme ended, with the final phase of their model being that of reflective thinking. According to Kurfiss (1988), the reflective judgment model is more epistemologically rigorous than Perry's (1970) scheme. King and Kitchener (1994) measure reasoning ability with their 'Reflective Judgment Interview' (RJI). During this interview, students were presented with a series of tasks (ill-structured problems) and asked to describe their position on the topic and the reasoning behind this position. The reflective judgment model (King and Kitchener 1994: 17) has seven stages that are divided among three phases, namely:

- ♦ *Phase 1:* Students demonstrate pre-reflective thinking (stages 1 to 3) and believe that there are right and wrong answers and that only the 'authorities' or 'experts' know the correct answers.

- ♦ *Phase 2:* Students demonstrate quasi-reflective thinking (stages 4 to 5) as they begin to question their previously held assumptions and realise that the ‘authorities’ can be wrong or biased. They slowly begin to realise that there can be more than one ‘correct’ answer to a problem.
- ♦ *Phase 3:* Students illustrate reflective thinking (stages 6 to 7) and believe ‘knowledge must be understood in relationship to the context in which it was generated’.

Each of these three phases will be conceptualised later in the study in conjunction with the information process research model.

The last and latest theory of model of the epistemology to be discussed here is that of Hofer (2000) that developed a questionnaire with items that also addresses four very similar, identical epistemological beliefs. Hofer’s questionnaire was designed so that the questions also referred to a specific field. In other words, in contrast to the questions developed by Schommer, Hofer’s questions do not refer to knowledge in general but to ‘knowledge in a specific field’ such as science and mathematics. The first two epistemological beliefs in Hofer’s questionnaire, namely ‘certainty’ and ‘simplicity’, were about the nature of knowledge, while the third and fourth beliefs address the issue of how a person comes to ‘know’ or ‘learn’ something, namely the ‘source of and justification for knowledge’. These four epistemological beliefs of Hofer (2000: 391) can be described as follows:

- ♦ *Certainty:* This belief refers to the extent to which the respondent thinks that knowl-

edge is certain as opposed to it being fallible and subject to change.

- ♦ *Simplicity:* This refers to the extent to which the respondent believes that knowledge is structured and organised in simple ways with a single right answer rather than in more complex ways with more than one right answer.
- ♦ *The Source of Knowledge:* This belief refers to the origin of knowledge; whether it comes from oneself (and one’s own experiences) or from others (such as the teacher or textbook).
- ♦ *The Justification for Knowledge:* This belief is closely related to the source of knowledge and is about the kinds of justifications that are offered in support of knowledge. These justifications may be on the basis of personal experience or the authority of experts.

Table 1 displays the stages of epistemological development of the six developmental models and exhibits their relationship or correlation with each other. It shows students’ progress through a series of stages or positions in a hierarchical fashion. In the beginning of their studies, students often have an absolutist, right-or-wrong view of knowledge. Through their study experiences they then continue to perceive knowledge as relative and contingent in context in which it was created. The first three models focus on how students’ epistemological beliefs influence their interpretation of their educational experiences, while the last three models examine how students’ epistemological beliefs affect their respective thinking and reasoning ability.

**Table 1: Models for the development of epistemological theories**

| <i>Level</i> | <i>Model 1:<br/>Intellectual<br/>and ethical<br/>development<br/>(Perry 1970)</i> | <i>Model 2:<br/>Women’s<br/>ways of<br/>knowing<br/>(Belensky,<br/>Clinchy,<br/>Goldberger,<br/>Tarule 1986)</i> | <i>Model 3:<br/>System of<br/>independent<br/>beliefs<br/>(Schommer<br/>1990)</i> | <i>Model 4:<br/>Epistemological<br/>reflection<br/>(Baxter 1992)</i> | <i>Model 5:<br/>Reflective<br/>judgement<br/>(King,<br/>Kitchener 1994)</i> | <i>Model 6:<br/>Knowledge<br/>in a specific<br/>field or<br/>discipline<br/>(Hofer 2000)</i> |
|--------------|---|--|---|--|---|--|
| <i>Low</i>   | Dualism   | Silence<br>Received<br>knowledge   | Simple<br>knowledge   | Absolute<br>knowing  | Pre-reflective<br>thinking  | Certainty  |
| <i>Med</i>   | Early<br>multiplicity<br>Late<br>multiplicity                                     | Subjective<br>knowledge  | Procedural<br>knowledge   | Absolute<br>knowledge  | Transitional<br>knowing<br>Independent<br>knowing                           | Quasi-<br>reflective<br>thinking<br>Simplicity   |
| <i>High</i>  | Contextual<br>relativism<br>Commitment  | Constructed<br>knowledge   | Innate<br>knowledge   | Contextual<br>knowing  | Reflective<br>thinking  | Justification  |

Kuhlthau's (1993) 'Information Search Process'-model forms the other dimension of the theoretical foundation of this study. She defines 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: 361). The stages of this model are task initiation, topic selection, pre-focus exploration, focus formulation, collection and presentation. In this study the Information Search Process (ISP) model was used to examine doctoral students' information-seeking behaviour while using the previously mentioned epistemological development models to determine their epistemological beliefs.

### METHODOLOGY

The study was based on a qualitative empirical correlation study among ten (n=10) randomly selected doctoral students from the College of Education at the University of South Africa. Ethical clearance was obtained from the College before the study commenced. The ten participants were individually interviewed and included seven male and three female students. The interviews lasted 30 minutes per interview and were conducted during October 2012. All the students were busy with their doctoral degrees and were school principals, while the average age of the participants was 43 years. Participants were purposefully chosen from a number of potential candidates and they represented a sample of convenience.

An e-mail message requesting the participants to participate in the study was distributed to the ten participants and interviews were consequently conducted to understand the participants' information-seeking behaviour. An interview guide with a number of embedded questions was designed to assess their epistemological beliefs. The interviews were conducted at the University where participants were asked ten questions about their information-gathering behaviour while completing their research proposals. Follow-up interviews as well as member checking were done to ensure the trustworthiness of the study as well as for the purposes of triangulation. The following three pivotal questions were asked during the interviews and focused specifically on issues related to doctoral students' epistemological beliefs:

- ♦ How did you decide which sources were good enough to use for your proposal?
- ♦ What criteria did you use for choosing sources?
- ♦ If you came across sources that contradicted each other, how did you treat that?

During the next phase of the research (data interpretation phase), the audiotapes were transcribed. The coding and data analyses consisted of seeking evidence about participants' epistemological beliefs and the influence of their epistemological beliefs on their information gathering patterns. This method of data analysis consists of the normal stages of data analysis using content analysis of research data (Weber 2010).

None of the six models of epistemological development discussed earlier was used explicitly for data analysis. All of the models, however, were used implicitly to analyse the interview data for evidence of epistemological beliefs. Nevertheless, the six models provided extensive information about the criteria used to assess the epistemological beliefs of the subjects in the study. The study used the three pivotal interview questions (mentioned above) to determine the participants' epistemological beliefs while also considering their responses to the other interview questions involving the role of peers, supervisors and librarians.

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

### FINDINGS AND DISCUSSION

After conducting content analyses of the interview data, each subject was placed into an epistemological development category. None of the ten participants was placed into the low category. This is consistent with other research that indicated few doctoral students enrolled for the degree with low or without epistemological development (Whitmire 2003). Three of the partic-

ipants were placed in the high epistemological development category, two in the medium-high category, a single one in the medium-low category and the remaining four participants in the medium category. Table 2 indicates the results of the analyses of the interview data.

The results of the content analyses confirmed the hypotheses about the expected relationship between epistemological beliefs and information-seeking behaviour. The relationship between these two constructs manifested itself during several stages of the Information Search Process model, particularly during stage 2 up to stage 5. Epistemological beliefs affected topic selection, the use of supervisors, search techniques, the evaluation of information encountered during the search process as well as the ability to recognise authority. These findings were then related to the different stages of the Information Search Process model and integrated with epistemological development analyses. The following three stages emerged:

**Stage 1: Task Initiation** (to recognise a need for information).

The task of writing a research proposal commenced with a requirement that students should read about their respective topics. Epistemological beliefs did not appear to influence this stage.

**Stage 2: Topic Selection** (to identify and select the general topic to be investigated).

This stage is indeed a very important and complex process for any doctoral student. The participants selected a variety of topics and topic selection was influenced by experience, age, gender and position at the school where each participant is based. Participants were required

to complete and submit a short one-paragraph statement indicating the topic they selected before beginning to compile their proposals. This task was used to encourage them to make a decision about their topic, but many participants noted that they knew in advance that their stated topic was negotiable and they often changed their topics. It appeared that on at least one occasion, a student allowed his supervisor to pick a topic for them. This participant was rated as a medium-low epistemological believer. In another instance, a colleague of one of the participants suggested that a medium-high epistemological believer does an analysis of two specific books before finally deciding on a topic for her thesis.

**Stage 3: Pre-focus Exploration** (to investigate information on the general topic).

During this stage, students searched for information on their topic and try to fit newly acquired information into their existing knowledge structures. Kuhlthau (1988) found that the subjects in her study encountered the most difficulty at this stage because they encountered information that was inconsistent or incompatible with their existing knowledge. Often, the information encountered during this stage depended on a student’s epistemological beliefs and determined if he/she would continue to pursue the topic. A medium-high epistemological believer stated in this regard: *I went through quite a number of different possible topics. I eventually decided that I would do something on school discipline and after reading on the topic, I decided on another topic.* Another medium-high epistemological believer noted as follows: *When I didn’t find much information about it, I moved on to another topic. I was studying a*

**Table 2: Biographical information with regard to the participants in the study**

| Participant(n=10) | Gender(M/F) | Academic discipline   | Epistemological level |
|-------------------|-------------|-----------------------|-----------------------|
| 1                 | M           | Education management  | High                  |
| 2                 | F           | Comparative education | Medium                |
| 3                 | F           | Didactics             | Medium-high           |
| 4                 | M           | Education management  | Medium                |
| 5                 | M           | Inclusive education   | High                  |
| 6                 | M           | Education management  | Medium-low            |
| 7                 | M           | Socio-education       | Medium                |
| 8                 | F           | Comparative Education | High                  |
| 9                 | M           | Education Management  | Medium                |
| 10                | F           | Education Management  | Medium-high           |

*very new topic that there was little information about it.*

Three types of mediators were useful to participants during this stage, namely their supervisors, other students (peers) and subject librarians. Supervisors were commonly cited by participants as referring students to particular information sources, for example one stated: *I talked to my professor a lot and she gave me ideas about other books*, while another participant said: *I used other students a lot to get recommendations on books*. In addition, a medium-high epistemological believer said: *I had a couple of friends who were principals with whom I discussed my studies in general and they all had thoughts as I went along. It was good to use them as a sounding board to hear what my own ideas sounded like.*

Students interviewed consistently used the bibliographies in the information sources to find other sources or what Ellis (1993: 470) labelled as "citation chaining". One participant said in this regard: *I looked in the references section and if they mentioned something that seemed to be a key article then I would want to go look that up*. After attending a database-searching class, a medium-high epistemological believer 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: 408) characterises as "journal run".

The most common information-seeking activity among participants was browsing journals. A student who was a medium-high epistemological believer found a pivotal article and describes the process as follows: *I was just randomly looking through a journal and found this article. Actually that was the best way, just to look through every single issue.*

A few participants mentioned asking subject librarians for assistance. A participant who was a medium-high epistemological believer was referred to a particular librarian by his supervisor. Together, they conducted an exhaustive search of the electronic indexes in his discipline. He was very satisfied with his encounter: *The librarian helped me instead of wasting weeks searching for materials*. Another student consulted with a librarian to confirm that he had conducted a thorough search. Most student participants at this stage search the online public access catalogue to obtain journal articles. Some mentioned that they were able to locate almost all of their information sources in the library.

Participants generally were not interested in interlibrary loans and few mentioned using the web at all, while they did not appear to know how to conduct very advanced or sophisticated catalogue searches and relied heavily on keyword searching. Searching for journals appeared to be an even more unfamiliar skill. A participant who was a medium-low epistemological believer might have benefited from searching for journals but stated: *I still do not know how to do it*. He continued: *I never had to look up a journal or maybe I should have; but just didn't*. Another participant simply 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 participants attended bibliographic instruction sessions, this did not lead to successful searches. Participants 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. Participants 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 student participants were so frustrated with using electronic indexes to find articles that they physically searched several years of the bound volumes of journals that they identified as important in their field.

**Stage 4: Focus Formulation** (to form a focus from the gathered information).

Kuhlthau (1991: 367) described this stage as a turning point in the process by referring to it as the stage "when feelings of uncertainty diminish and confidence increase". Participants were asked to identify a pivotal point in their studies when their research took a sudden turn. A medium-low epistemological believer reached a turning point in her studies during the school holiday break when she had nothing to do other than to read the books that she borrowed from the library. She took notes and realised what her topic was about. She was able to carry out a more focused information search after this point.

Frequently talking about their studies also assisted participants' to focus more. A student who was a medium-high epistemological believer narrowed her six topics to one topic based



*upon the fact that the more I talked about it, the more I formulated what my ideas were.* Another participant said that after talking regularly with her supervisor, she began to understand her topic. The best thing to do for a high epistemological believer was *talking with my professor, because I have so much information to go through.*

**Stage 5: Collection** (to gather information related to the focused topic).

This fifth stage occurs after the pivotal moment when students begin to focus on a specific topic. They used a variety of criteria for evaluating information found at this stage. To assess their epistemological beliefs, participants 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 proposals did not seem to trouble most students interviewed. A high epistemological believer said that when she encountered this type of information *it really didn't throw me off or change my topic.* A medium-high epistemological believer was not able to determine the validity of her sources and relied on her subject librarian for assistance: *I used the major works; my librarian told me: "these are the ones you should really look at".*

Another participant was comfortable about recognising 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 participant acknowledged that she had to fight the temptation to just disregard conflicting material. Another participant felt more comfortable about assessing the authority of information sources. A high epistemological believer recognised that *there are some journals like I said before that are really good and are known to be really good and if the articles are in there it's probably worthwhile.* Another participant 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 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 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 that he encountered. He viewed his information sources through his personal experiences by integrating this new knowledge with his existing knowledge. He asked himself: *How does this compare with what I saw? How does this compare with the experiences that I know that people were having?* One other student found that *different sources were giving me different evidence either for or against my proposal topic,* 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 research proposal.

One participant 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, while another one resolved conflicting views by choosing the authors that everyone else selected. A high epistemological believer 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 conclusion.* He said he felt competent enough to criticise published authors. A medium-low epistemological believer 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 of just rejecting, you know, ignoring 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 participant met with her supervisor when she had difficulty selecting a topic for the thesis and was given a topic by the supervisor.

**Stage 6: Presentation** (to complete the search and to prepare to present the findings).

Only one participant, a high epistemological believer, had presented his proposal as a paper at a local conference and has reached this stage of the ISP model.

## CONCLUSION

This study examined the correlation between epistemological beliefs and information-seeking behaviour among a group of doctoral students in a specific setting. This study has both practical and theoretical implications; specifically for reference librarians in academic libraries. Depending on a doctoral student's epistemological beliefs, a student will be more or less likely to ask for reference assistance for finding information sources for academic assignments during the exploration stage. Students who are at the higher stages of epistemological development are more likely to seek assistance from reference librarians.

Future research in this field would benefit from the use of other research instruments to measure epistemological beliefs in conjunction with personal interviews to provide triangulation. Longitudinal studies would also be useful because epistemological beliefs are developmental and change during students' exposure to a variety of learning and social activities. In addition, the connection between the 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 behaviour and epistemological beliefs.

The findings of this study provide insights into the impact of students' epistemological beliefs on their information seeking patterns and provide, in addition, a rich theoretical foundation for future information-seeking behaviour research among doctoral students. The findings furthermore confirm the correlation between core epistemological beliefs and information gathering patterns amongst South African doctoral students and provide substantial justification for using epistemological beliefs in the supervision of doctoral students.

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